

FIVE PERSPECTIVES ON TEACHING IN ADULT AND HIGHER EDUCATION

Daniel D. Pratt and Associates
The University of British Columbia

With Foreword by Stephen D. Brookfield



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CHAPTER 6

THE DEVELOPMENTAL PERSPECTIVE

Cultivating Ways of Thinking

Ric Arseneau and Dirk Rodenburg

INTRODUCTION

Ric: Before getting into medical school I took a course in comparative vertebrate anatomy. I found the course difficult to understand and overloaded with facts. In addition to my disinterest in the course, I was suffering from "mark anxiety"—from the fear of not getting into medical school. I tried to understand the material but was not rewarded for comprehension. Extra reading outside of class notes was actually detrimental to my grade. The teacher seemed to give a mixed message. Although he said he wanted us to understand and be able to compare and apply what we knew, he actually rewarded us for the reproduction of his own ideas. In fact, word for word reproduction from class notes was the most valued. As the final exam approached I realized I needed an A+ to get an overall A average. Because of time constraints and the competing demands of other exams, I decided to rehearse and memorize the lecture notes for the semester without any attention to understanding. I knew what would be rewarded: the reproduction of well-rehearsed answers. This strategy resulted in a mark of 90%—my best mark to date for the course.

Dirk: For one of my graduate level statistics exams, a question focused on calculating interval ranges for a sample of scores. The task itself was relatively mechanistic, and required some simple procedural steps and calculations. I wanted to accompany my calculations

with an explanation of my reasoning for each step; it seemed this would demonstrate my conceptual basis for solving the problem. To me, the ultimate accuracy of my calculations was of secondary importance, since virtually all statistical calculations are processed by computer. What was most important, I felt sure, was to demonstrate an ability to interpret an analysis. Therefore, I spent a considerable amount of time making sure that each step was accompanied by a clearly defined and written rationale linked within a coherent flow of reasoning. When I received my exam back, however, my written rationale was completely ignored. Instead, I was marked completely and exclusively, on the accuracy of my answer (which had, indeed, involved an error in calculation).

How much learning occurred in the examples above? Did the teachers believe learning had occurred? What does Ric's excellent grade and Dirk's poor grade reflect in each case? What does it mean for learning to occur? What is the role of understanding in learning? What kinds of evidence should teachers seek and accept as tangible proof of understanding? What should teachers be trying to accomplish in their teaching? What is the relationship between teaching and learning?

Seriously consider these questions rather than gloss over them. They don't have right answers, nor do we propose to provide you with any. Your answers to these questions can, however, provide you with insight into your personal theories of teaching and learning.

Our practice as teachers is informed and guided by personal theories (Rando & Menges, 1991). These theories, however, are implicit in that they are outside our usual awareness; they are assumptions that we take for granted. Insight into your personal theories will help uncover the rationale for much of your reflexive (cf., reflective) behavior as a teacher. Personal theories allow you to make sense of your teaching environment and to deal with problematic situations. Further, they are the viewpoint from which you interpret formal theories of teaching and learning. As you read this chapter (and the others in this book), you should continuously ask yourself, "Is this in keeping with what I believe?"

There is a problem, however, with trying to uncover and make explicit personal theories of teaching and learning. Often, we don't "practice what we preach"; there are discrepancies between our stated beliefs and intentions on the one hand, and the way we behave on the other. Our "espoused theories" are out of keeping with our "theories-in-practice"

(Argyris & Schon, 1978, cited in Ramsden, 1988). Espoused theories are those values and strategies we proclaim, whereas theories-in-practice represent values and strategies which inform our actions, of which we are largely unaware and over which we have little control (p. 257). Therefore, while reading this chapter, you should also consider to what extent what you say is consistent with how you behave.

Go back to the examples above. Can you infer both teachers' espoused theories? What evidence do you have of their theory-in-practice? Do you suppose they are aware of the discordance? The discordance between espoused theory and theory-in-practice is a common problem in higher education. For example, the concept of excellence, and the goals for teaching and learning usually include variations on the following themes (Ramsden, 1992):

- To teach students to analyze ideas or issues critically
- To develop students' intellectual/thinking skills
- To teach students to comprehend principles or generalizations.

Yet, our experiences in the examples above are likely more in keeping with the usual experience of learners. Several studies (Ramsden, 1992; Dahlgren, 1984) seriously question the effectiveness of higher education and conclude that:

- Many students are accomplished at complex routine skills including problem-solving algorithms.
- Many students have amassed large volumes of detailed knowledge.
- Many students are able to reproduce large quantities of factual information on demand.
- Many are able to pass examinations.
- But many are *unable* to show that they understand what they have learned, when asked simple yet searching questions that test their grasp of content. They continue to profess misconceptions of important concepts; their application of their knowledge to new problems is often weak; their skills in working jointly to solve problems are frequently inadequate.

Ramsden (1988) cites one particularly striking example in which 80-90% of U.S. college students were unable to explain concepts from ninth grade algebra despite being able to manipulate the symbols and pass behavioral objectives. They were unable to demonstrate that they understood. This example illustrates the central theme of the Develop-

mental Perspective: *learning has occurred only when learners are able to demonstrate understanding*. Therefore, teaching from this perspective has to do with facilitating the learner's intellectual development (i.e., *development* of the intellect). The goal, then, is to close the gap between teachers' espoused theory and theory-in-practice by challenging learners to think critically, to solve problems, and to understand for themselves.

This chapter, as well as the others in this book, reflects a particular orientation toward the theory and practice of teaching adults. Not only does it provide a set of beliefs and intentions to guide specific instructional techniques, it also describes an educational philosophy consistent with our practical and theoretical understanding of cognition and learning. The Developmental Perspective parallels an emerging theoretical perspective of learning and knowing termed constructivism (e.g., Candy, 1991). The constructivist perspective is consistent with a lot of current philosophical and neurophysiological views of brain function (e.g., Anderson, 1992).

It is worth emphasizing that the Developmental Perspective represents a set of beliefs as opposed to a set of teaching behaviors. In other words, teaching is not merely the application of specific rules in specific situations. Teaching is the visible expression of an underlying set of beliefs a teacher brings to the learning environment—beliefs that help the teacher to better navigate the murky waters of practice. Therefore, the degree to which your practice reflects a particular teaching perspective in this book is a matter of the degree to which your personal theories resonate with the set of assumptions belonging to a particular perspective. Recall that most of us operate from more than one perspective. We hope to persuade you that operating from the Developmental Perspective is important in bringing about understanding. Even if your practice is primarily informed by one of the other perspectives in this book, we believe that having the Developmental Perspective operate in the background will improve your teaching.

The remainder of this chapter is divided into four main sections: key ideas, developmental principles, bridging knowledge, and examples from practice. We will begin by presenting two key ideas underlying the Developmental Perspective. The main concepts underlying the Developmental Perspective will be presented as a set of seven "Developmental Teaching Principles." This will be followed by a discussion of the "special knowledge" required to teach from this perspective. Finally, we will provide you with examples of developmental teaching from our own practices and from the literature.

KEY IDEAS

Before embarking on the main discussion of the chapter, it is important to consider two key ideas underlying the Developmental Perspective: (1) How we come to understand something, and (2) The relationship between teaching and learning.

How We Come to Understand

Have you ever wondered how a child comes to learn and understand the concept of "dog?" The child may notice, or the parents may point to a dog and say "dog." What the child sees and attends to will depend on that particular child. Does the child notice the size, the color, short ears, long ears, pointed ears, straight tail, curly tail, etc.? What is it that the child understands when the parents say "dog"? On another occasion, the child may see a cat and say "dog." The parents will correct the child and say, "No . . . Cat." The child must now take her concept of dog and change its internal representation so that it more closely matches that of her parents. With time and interaction with her parents, the child will develop a very good understanding of what a dog is (i.e., an accurate and appropriate internal representation of the concept "dog").

Obviously, the concept of dog was not transferred from the parents to the child. The child had to construct an internal representation of the concept. She used the concept to interpret (i.e., construe) and make sense of new situations (e.g., mistaking a cat for a dog). By interacting with her parents, she constructed increasingly more sophisticated and more accurate internal representations of the concept (e.g., not all small furry animals are dogs). She developed better conceptions (i.e., parents' preferred conception).

Conceptual understanding then, has to do with the dual acts of constructing and construing. Internal models are constructed and used to construe (i.e., interpret) new situations. Testing one's constructions with those of others allows us to reach a common understanding. However, given the personal manner in which internal representations are constructed, all constructions are necessarily idiosyncratic; we all have a different understanding of the same concept. Our concepts may overlap sufficiently with those of others so that we can understand and communicate with each other.

The concept of "dog" is relatively unproblematic; we can all agree

on what a dog is. However, higher levels of abstraction are needed to understand concepts such as justice, beauty, and love. Each one of us understands these concepts differently based on our history with the concept. For instance, what does the word "mother" bring to mind? How might it differ in the following situations? What if you were adopted? What if you were an orphan? What if you were abused? The possibilities are endless, as are the subtle and not-so-subtle difference that each one of us carries for the concept of mother.

Although, personal constructions are idiosyncratic, there may be sufficient overlap among individual constructions within a group for agreement and understanding to occur (i.e., social constructions). For instance, the concept of "healthy looking" is a social construction. There is no such thing as healthy looking; the concept simply represents a more or less agreed-upon definition by a specific group. Considering a lean muscular woman as fit and healthy looking is a social construction of a 1990s western society. The same outward look may have a totally different meaning to a different social group or at a different time. Would this lean and muscular woman evoke the idea of healthy looking in the 1800s? Therefore, despite their idiosyncratic nature, personal constructions may overlap sufficiently for a common meaning to occur. However, common meaning may differ for different groups or at different times.

In summary, understanding comes from the personal construction of internal representations of concepts. Constructions are used to construe new situations. The iterative acts of constructing and construing allow us to refine our understanding of a concept. Further, dialogue between individuals allows the development and sharing of common meaning for some concepts (i.e., social constructions). However, social constructions are necessarily constructions and do not represent an external reality, but simply an internal representation of reality. For a given group, some constructions may be more acceptable or correct.

The Relationship Between Teaching and Learning

The relationship between teaching and learning was called into question by a cartoon in which a boy told his friend that he had taught his dog how to whistle. With his ear up to the dog's face, the friend said, "I don't hear him whistling." The boy replied, "I said I taught him. I didn't say he learned it." (Whitman, 1990)

The less than direct relationship between teaching and learning is obvious but often forgotten. It is beyond the scope of this chapter to pro-

vide a detailed discussion of this relationship. Our goal is to challenge a taken for granted assumption held by many individuals: that teaching necessarily results in learning. Given that this is a book on teaching, it is important that you not lose sight of the indirect relationship between teaching and learning. You will need to ask yourself what other forces have a positive (or negative) impact on learning. Our view of the relationship between teaching and learning will become obvious as the ideas in this chapter are developed.

DEVELOPMENTAL TEACHING PRINCIPLES

Consider the following anecdote:

Ric: I recently had the opportunity to supervise a junior colleague during his first clinical teaching assignment. After observing one of his clinical teaching sessions, I asked him to comment on what he thought the students learned. He was caught somewhat off guard and replied, "I think I did some good teaching, but I've actually never thought, have the students done good learning?"

Teaching from the Developmental Perspective is Machiavellian: "the ends justify the means." Therefore teaching from this perspective has more to do with good *learning* than with good *teaching*. The focus, then, is on the development of learners' thinking, reasoning, and judgement rather than on specific teaching performances. There is no one right way to teach, only better ways depending on the content, the context, the learners, and the teacher. Therefore, this chapter will focus on the beliefs and intentions that inform teaching from a Developmental Perspective in the hopes that individual teachers will creatively interpret these into teaching actions that work for them. In another section we will provide examples from our own practices to illustrate some of the principles of developmental teaching. In reading this chapter, it might be helpful for you to consider your own teaching. Note any similarities and differences paying particular attention to your underlying beliefs and intentions as a teacher. If you have never taught, read this chapter from the learner's perspective.

We believe the best way to understand this perspective is experientially. The following seven principles and discussions will highlight the Developmental Perspective. These seven Developmental Teaching

Principles are based largely on the works of Ramsden (1988), Marton, Hounsell, & Entwistle (1984), on student learning, and on the work of Schmidt (1993) on the principles of cognitive learning.

- Principle 1: Prior knowledge is key to learning.
- Principle 2: Prior knowledge must be activated.
- Principle 3: Learners must be actively involved in constructing personal meaning (i.e., understanding)—the links are more important than the elements.
- Principle 4: Making more, and stronger, links requires time.
- Principle 5: Context provides important cues for storing and retrieving information.
- Principle 6: A. Intrinsic motivation is associated with deep approaches to learning.
B. Extrinsic motivation and anxiety are associated with surface approaches to learning.
- Principle 7: Teaching should be geared toward making the teacher increasingly unnecessary: that means, the development of learner autonomy as well as the intellect.

Principle 1

Read the following paragraph as though you were preparing for a test.

Simple Malfunctions and their Remedies: Air in the fuel system.

The fuel injection system consists of the fuel tank, fuel feed pump, fuel filter, fuel injection pump, injection line, and fuel injection valve. If air enters any part of the system, with the exception of the fuel tank, fuel will not be injected into the cylinders. Check the fuel injection "sound" in the following manner: (1) Pull out the knob for engine warm-up and place the control lever in the "half speed" position; (2) Open the delivery cock of the fuel tank; (3) Loosen the fuel strainer air-bleed bolt; (4) Move the priming lever of the fuel feed pump up and down. All the air has been bled out of the fuel line when only fuel flows out. After bleeding, retighten the bolt; (5) To "Bleed Air" from the fuel line, loosen the air venting bolt on the fuel

injection pump and move the priming lever up and down until all the air bubbles out.

How well would you do on the test? Why? Unless you are a marine diesel mechanic, you probably don't understand the information. Given enough time to rehearse, you could commit the short passage to memory. But how long would you remember? What if you were asked to provide an explanation, or worse, asked to carry out the steps?

Principle 1: Prior knowledge is key to learning.

Prior knowledge is the most important determinant of new learning. You couldn't make sense of the above information because you had no prior knowledge in this area. You couldn't understand because you couldn't connect it to something you already knew. Prior knowledge is the foundation on which new knowledge is constructed; new knowledge is built from (or onto) existing conceptions (prior knowledge).

Learners always have some relevant prior knowledge. It is your role as a teacher to access the right starting point for your learners. Make it real. Start with something they know. Stay within their "zone of proximal development" (Vygotsky, 1978): not too easy, not too abstract.

There is a direct relationship between the amount of learners' prior knowledge and the amount learners can learn. The less they know about something, the less they can take in. Paradoxically, as teachers we often try to present the most to those with little prior understanding.

Implications for teaching:

- Start with the learner.
- Teaching requires an understanding of the range of learners' prior conceptions (and misconceptions).
- It is the teacher's responsibility to adjust the content to the learners' prior understanding of it.
- For learners in an unfamiliar content area: "less is more."

Principle 2

Read the following paragraph as though you were preparing for a test.

Two is easier than three, but one is easiest. Common sense is the most important asset. Power struggles and confrontation should be kept to a minimum. Arts and crafts can provide entertainment. Don't forget

snacks with TV. Keep important phone numbers handy. Money can be saved for college.

How well would you do on the test? Likely better than in the example from principle 1. Now, reread the paragraph, keeping in mind its title: Babysitting. This example shows that prior knowledge is a necessary but not sufficient condition to learning; it must be activated (Schmidt, 1993).

Principle 2: Prior knowledge must be activated.

As a teacher, it isn't enough to only have an idea of where your learners are and to start from there. First of all, your estimation may be wrong; you may be outside their zone of proximal development (i.e., too advanced or not advanced enough). Second, even if you are right, what your learners already know may not be at the front of their mind ready for use; prior knowledge needs to be activated to be most useful.

It has been suggested that the best starting point is common sense and everyday experiences—remember, learners always have some relevant prior knowledge—and to progress to abstraction, then back again to the application of theory in practice (Ramsden, 1992). Consider the following example:

Ric: Medical students are often so caught up in "thinking medicine" that they block out their common everyday experiences.

Teacher: How long does it take for someone to excrete a free water load?

Students: Puzzled look. No response.

Teacher: Oh, come on (jokingly), you all know this . . . If you go to the movies and buy a super jumbo 10 gallon drink, what are the chances that you'll sit through the movie without having to go to the washroom?

Student 1: Not long, maybe an hour or so?

Teacher: How full does your bladder have to be before you feel you have to go?

Student 2: I see, it must start being excreted almost immediately; it just takes time for the bladder to fill before you get the sensation to go.

Teacher: If a patient is receiving too much free water IV (intravenous), what should happen?

Student 1: The patient should start excreting it almost immediately.

Teacher: Exactly . . . you'd expect the same "Movie Theatre Phenomenon," unless there is something wrong. . . .

In the case above, the medical students had useful prior knowledge but couldn't use it. A simple question from an everyday experience activated that prior knowledge and allowed them to understand. The case also illustrates the easy flow from common sense and everyday experiences to abstraction, then back again to the application of theory in practice.

An alternative strategy for activating prior knowledge is "planting." Its use and application is similar to that in literature and movies. The hero of the story should not get herself out of a tight situation with a hand grenade she just happened to be carrying in her purse. The author better have introduced the hand grenade earlier in the story for it to be believable. Similarly, you can "plant" important concepts by reactivating them from the learners' memories at the beginning of the lesson. A review and reactivation of important concepts will help with the flow, believability, and understandability of your lesson.

Finally, the reactivation of prior knowledge has a diagnostic component. It allows you to diagnose the level of your learners and to determine whether or not your lesson plan is within their zone of proximal development. For example, a teacher who begins a class by reviewing the previous class often *tells* the learners what they learned last time. Instead, the learners could tell the teacher what they actually learned. Based on this information the teacher can determine if the day's lesson plan is appropriate.

Implications for teaching:

- It is insufficient to make assumptions about your learners' prior knowledge; let them tell you (and activate it).
- A good way to activate prior knowledge is to cite common sense and everyday experience. From there, move to abstraction, then back again to the application of theory in practice.

Principle 3

Case 1

A humanities teacher is leading a small group discussion based on an assigned reading. Although the students have obviously read the pa-

per, based on their ability to recite parts of the text, few of them seem to have grasped the main "point" of the author.

Case 2

A physics teacher is correcting an exam. The students had no problems "plugging" numbers into formulas, yet few were able to satisfactorily answer questions in a second part of the exam which required them to explain concepts underlying the formulae.

Case 3

A disgruntled student comes in to challenge a recent low mark on an essay. The essay assignment presented a statement and asked the students to agree or disagree, and defend their opinions. The student complains and says "all the facts" are included. The teacher points out that the student has simply arranged a series of facts, but hasn't really interpreted the information or made an argument. Further, the impression given by the essay is that the student just started writing and stopped after fulfilling the required number of words; the essay wasn't organized or structured. Finally, the student had not used data as evidence, in fact, there was no indication that the difference between evidence, opinion, or example was understood.

What do the learners in these three cases have in common? How are they similar to the learner studying comparative vertebrate anatomy in the anecdote in the introduction to the chapter? How are they different when compared to the child who comes to understand the concept of dog? From a Developmental Perspective, learning occurs only if learners give meaning to knowledge and link it to what they already know (i.e., prior knowledge). The learners in the above cases focused on reproducing the content rather than understanding it. We would argue that little (if any) useful learning occurred.

Principle 3: Learners must be actively involved in constructing personal meaning (i.e., understanding)—the links are more important than the elements.

The processes of teaching and learning have many features in common with the example of how a child comes to understand the concept of dog. The parent does not tell the child what a dog is; the child must come to understand the concept internally. The parent has in mind the desired conception and becomes involved in a dynamic dialogue with the child. The child has the opportunity to test his or her conception with that of the parent and the parent has the opportunity to correct miscon-

ceptions. Eventually the child and parent negotiate the meaning of dog, and the child's understanding comes to overlap the parent's conception.

Teachers and learners often assume that knowledge is transferred intact from teachers (and textbooks) to learners; they fail to appreciate the personal and idiosyncratic nature of learning and knowledge. According to White and Gunstone (1992),

understanding develops as new elements are acquired and *linked* with the existing pattern of associations between elements of knowledge. Addition of new elements will often stimulate reorganization of the pattern as the person reflects on the new knowledge and sees how it puts older knowledge in a different light [*italics added*]. (p. 13)

Given that learners and teachers (in fact all individuals) necessarily have different patterns of associations (i.e., internal representations or maps), it is impossible for teachers to transfer a piece of knowledge to learners. Meaning and understanding have to do with the connections of a new element of knowledge to existing knowledge, rather than the new element itself. Without some way of linking the new knowledge into their current and personal maps, learners usually forget. Learners must be actively involved in constructing personal meaning from the raw materials provided by teachers if teachers are to help learners achieve understanding.

Teaching should therefore focus on helping learners construct personal meaning. Approaches to learning aimed toward this end have been termed "deep" (i.e., an emphasis on meaning) and "holistic" (i.e., an emphasis on organizing principles to understand "wholes") in contrast to those methods of learning with a focus on reproduction (i.e., "surface" approach) (Eizenberg, 1988; Marton & Saljo, 1984). According to this perspective, true learning and understanding can only occur when learners search for personal meaning by organizing information into an integrated and structured whole (i.e., use of a deep/holistic approach). The learners in the three cases above used a surface approach as evidenced by their lack of understanding and emphasis on reproduction.

Therefore, teaching from the Developmental Perspective emphasizes a *qualitative* change in learners rather than a *quantitative* one; learning has to do with knowing *differently* rather than knowing *more*. Teaching has to do with promoting a structural or morphological change in learners' thinking rather than adding to the number of facts in their knowledge base.

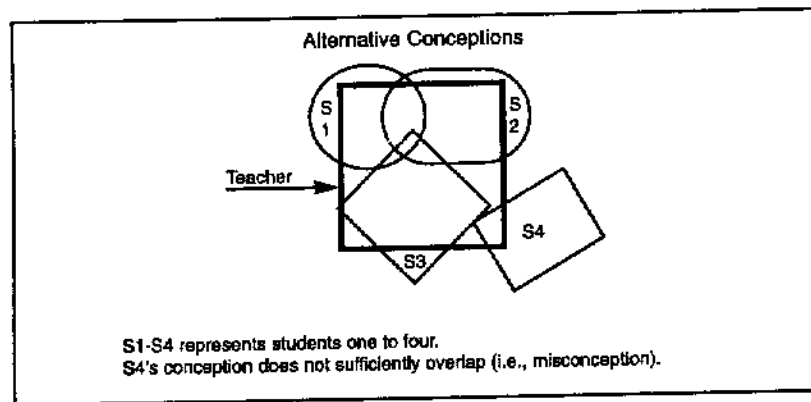


Figure 6.1 Comparison of Teacher's Conception of an Idea with That of Four Students

Given that each learner will have a different set of prior knowledge elements, each learner will necessarily have a different understanding of a concept—that is, they will construct a different sense of the information. Despite the idiosyncratic nature of each individual's understanding, it is possible for them to overlap sufficiently to come to a common understanding. This is represented in Figure 6.1. Notice the conceptions of students S1, S2, and S3 have much in common with the teacher's conception. However, S4 has a conception of the idea that is significantly different than the teacher's.

You should now have a better understanding of one of the teaching implications from principle 1: Teaching requires an understanding of the range of learners' prior conceptions (and misconceptions). Further, you should appreciate that teaching from this perspective assumes a desired endpoint (i.e., preferred conception or range of conceptions). Therefore, the teachers' role is to lead the learners from their existing conceptions to the preferred conception. For instance, learners may have a naive conception of selling price as reflecting the cost of materials and production. An economics teacher may want to move the learners to a more sophisticated understanding that includes supply and demand.

Good developmental teachers will not only have a good idea of learners' starting points and the desired endpoint, but will also know effective ways to help learners cross the bridge to new understanding. This "bridging knowledge" (Pratt, personal communication, May, 1995) has

also been termed "pedagogic content knowledge" (Wilson, Shulman, & Richert, 1987) and will be discussed in the next section. It is different from simple content expertise and has to do with effective ways of representing the content for learners' understanding. Bridging knowledge is what separates an expert teacher from a content expert.

Implications for teaching:

- The developmental teacher is a guide, a coach, and a co-inquirer more than a source of knowledge and information.
- Teaching expertise has to do with ability to help learners cross from old conceptions to new ways of understanding (i.e., bridging knowledge).
- Teachers should encourage the development of a "deep" (i.e., an emphasis on meaning) and "holistic" (i.e., an emphasis on organizing principles to understand "wholes") approach to learning and discourage a "surface" approach (i.e., an emphasis on reproduction).
- Teachers should not accept verbatim reproduction as evidence of learning but should become adept at probing for understanding.
- Learners' wrong answers should be seen as evidence of misconceptions that need to be addressed.

Principle 4

An undergraduate anatomy student spends considerable time making a set of anatomy flash cards for all the major muscles including their origin, insertion, innervation, and major action. An envious (but less industrious) student convinces the first student to lend him the cards to study for the exam. Both students adopted a deep, holistic approach to learning, but one student does significantly better on the exam. What is a plausible explanation?

The first student constructed the cards according to her prior knowledge, therefore she had an advantage. But, there is another factor as well. The second student may think that the first student wasted a lot of time making up the cards, but efficiency may not be effective in the long run. This is the paradox that underlies principle 4.

Principle 4: Making more, and stronger, links requires time.

Learners need time to dwell and cognitively manipulate new ideas in order to increase the number and the strength of the links to new knowledge as it is incorporated into their personal construct system. Cementing

new knowledge into the framework through meaning takes time; it cannot be short-circuited in pursuit of efficiency. Unfortunately, "the period for mulling over that is reportedly needed for learners to make interpretative sense of what is happening to them is neglected" (Brookfield, 1990, p. 140).

Learners who focus on the links between knowledge elements rather than the knowledge elements themselves are said to be elaborating their knowledge base (Coles, 1991). An elaborated knowledge base is associated with better examination scores, and also with the ability to apply knowledge to new situations and problem solving. The greater the number of links to a piece of knowledge, the greater the number of ways to access that piece of knowledge (i.e., retrieval pathways or cues). Elaboration takes time. Learners need time to link ideas both within and between subjects, and for learners in the professions, to link theory and practice. Unfortunately, in the hectic pace to cover content, teachers often leave little time for learners to reflect on what they are learning. The endpoint of learning, then, is the development of an elaborated knowledge base through the use of a deep holistic approach to learning.

Implications for teaching:

- Teachers need to build in time and opportunities for learners to elaborate their knowledge base (i.e., increase the number and strength of links).
- Teaching more (e.g., covering the syllabus) may result in learning less.
- Teachers make knowledge more accessible, more transferable, and more usable when they help students make links within and between subjects, as well as between theory and practice.

Principle 5

Case 1

Almost everyone has had the following experience. You are walking down the street and you meet someone who greets you with a familiar tone. You smile, return the greeting, and continue walking. But you just can't seem to "place" the person. Try as you might, you don't remember where you know them from. The next day at work, you come across the same person and immediately recognize them as a coworker from another department.

Case 2

Undergraduate medical education is traditionally separated into two

stages: preclinical education taught by basic scientists and clinical education taught by practicing clinicians. Many students go through growing pains as they make the transition from preclinical to clinical medicine. Although they have spent 2 years learning anatomy, physiology, and pathology, they can't seem to access the information to understand or solve clinical problems. To many students, preclinical and clinical education embody two separate and unrelated bodies of knowledge. Their understanding of glucose metabolism from the preclinical years is not very helpful for understanding diabetic emergencies when they start seeing patients. Many students, therefore, see their task as "relearning" once they enter the clinical years.

How are the two cases above similar? Can you provide an explanation? In the first case, you knew the person in a work context but were unable to access that information in a different context. Similarly, medical students are unable to retrieve information learned and stored in the context of basic scientists once they are seeing patients (i.e., clinical context). Since basic scientists and clinicians think differently, their knowledge base is linked differently and therefore accessed by different cues (i.e., retrieval pathways or cues; see principle 4); their knowledge base has a different structure or morphology (see principle 3). Some medical students recognize their task as recontextualizing the information: changing the links, the associations and the cues of their knowledge base. For other students, it becomes a matter of learning twice.

Principle 5: Context provides important cues for storing and retrieving information.

The term *context* is used in different ways in the literature. In this discussion, context means the perspective from which the content is understood. Other contexts will be discussed later.

From a Developmental Perspective content cannot be separated from context. The information must be understood in relation to some perspective. Therefore, learning cannot be context free. Knowledge, and its organization into the student's personal construct system, is highly dependent on the context in which it was learned. Recall the anecdote from principle 1 in which the learners had prior knowledge of the "Movie Theatre Phenomenon" (i.e., large volumes of water don't take long to excrete) but couldn't explain a clinical question. Their prior knowledge was activated in order to have them understand and personally connect with a new concept. One could argue that they already understood the

concept, albeit in another context. The same anecdote could therefore be used to explain principle 5. Prior knowledge does not transfer across contexts very well, just as new knowledge does not. The idea is to have learners “reach across contexts” to make links and understand new concepts in light of what they already understand (i.e., recontextualize information). Further, the more contexts from which information is learned, the more accessible and usable it is. We believe that learners can be encouraged to do such “reaching” and thus link what they are learning with what they already know. This is how we understand a deep approach to learning (see principles 4 and 5). That is, when studying new material, learners should be encouraged and assisted in relating the content to other situations.

Implications for teaching:

- Learners should be taught in the context from which they will eventually use their knowledge.
- Teaching from several contexts makes knowledge more usable, if learners understand the links between contextual representations of knowledge.

Principle 6

This principle involves you in a simple exercise while reading the following vignettes. Decide whether the learner is adopting a deep or surface approach to learning and comment on what you think is driving the learner to adopt that particular approach (i.e., what is the motivating force?).

Vignette 1

The first vignette is from the movie, *River's Edge*. The scene depicts a classroom the day after one of its students has been found murdered at the river's edge. An animated and emotional teacher, who can best be described as a throwback to the 60s, is indulging himself in a long diatribe on the meaning of this senseless killing. One of the students in the class interrupts by lifting his hand.

“Yes?” asks the teacher.

“Will this be on the test?” responds the student.

Deep approach/Surface approach (choose one)

Driving force(s): _____

Vignette 2

Two students are taking a postgraduate course in anthropology. The first student, from another department, took the course because it fit his time slot and still allowed him to play varsity soccer. Besides that, his faculty advisor strongly suggested that he take this course. The second student, from the department of education, was relieved to get into the course from the waiting list because she plans on conducting some qualitative research as part of her thesis; this course would be very helpful in understanding qualitative research methodology.

As part of the course requirements, the students have to write an essay on an assigned topic. When reading the source materials, the first student concentrates mainly on finding suitable quotes. He starts his essay by defining the concept. He makes sure to include many quotes which he groups and arranges into subheadings. He churns out his essay in time to go drinking with his buddies. The second student is concerned that the essay topic is not relevant to her needs and negotiates with the teacher to write on a topic more closely related to her thesis. She spends several days reading source materials and finds many contradictory opinions. In fact she notes that the same data is used to support opposing points of view. She interprets the information in light of her thesis proposal and adopts a particular point of view. She organizes her essay as an argument, using evidence from the literature to back her position. Further, she highlights some of the inconsistencies and possible misinterpretations from opposing camps.

Student 1

Deep approach/Surface approach (choose one)

Driving force(s): _____

Student 2

Deep approach/Surface approach (choose one)

Driving force(s): _____

Vignette 3

It's the night before the biology exam. A student sits in front of a pile of lecture notes and textbooks. How could she have left all of this to

the last minute? As she reads, she is consumed by a feeling of dread and keeps thinking, "there's so much to cover and so little time left." She has difficulty concentrating and her mind keeps drifting to thoughts of failure.

Deep approach/Surface approach (choose one)

Driving force(s): _____

Vignette 4

A final year medical student is studying for his internal medicine exam. He finds that the demands of patient care are both exciting and arduous. For the first time, he sees the relevance of much of what he is learning. Unfortunately, the end of rotation multiple choice (MCQ) exam has been hanging heavily over his head throughout the rotation. On the one hand, he wants to read topics relating to his patients to understand their illnesses and to answer questions that come up regarding their management. Unfortunately, his past experience with MCQ exams tells him that understanding is not rewarded. He knows that memorized facts are quickly forgotten but he really needs an "A" on this exam if he wants to get into the residency of his choice.

Deep approach/Surface approach (choose one)

Driving force(s): _____

Vignette 5

A student attends an engineering lecture. The teacher is obviously interested in her work and concerned that her students understand many aspects of engineering. Her enthusiasm is infectious and the student listens intently, forgetting to take notes. The teacher specifically illustrates the relevance of concepts to the real world of engineering by relating vivid and humorous anecdotes. At one point during the lecture, the student has an "Aha!" experience, as a concept he has been struggling with in another course suddenly becomes clear.

Deep approach/Surface approach (choose one)

Driving force(s): _____

Vignette 6

Sam is taking part in a small group calculus tutorial. The tutorial leader poses a question to each student in order by seating arrangement. Sam's turn is next. The tutorial leader is impatient with stu-

dents who cannot provide immediate answers and ridicules them before moving on to the next student. Sam can't "think." The only thoughts that enter his mind are how stupid he will look if he can't answer his question.

Deep approach/Surface approach (choose one)

Driving force(s): _____

Now consider each vignette in terms of the driving force (i.e., learner motivation). Is the source of motivation from within the learner (i.e., *intrinsic* motivation) or is it perceived as an external pressure (i.e., *extrinsic* motivation)? Also speculate on the level of anxiety experienced by the learner. Go back and label each vignette as I. M. (intrinsic motivation) or E. M. (extrinsic motivation). Also identify those vignettes in which the learner is experiencing a high level of anxiety (H. A.). Can you detect a relationship between motivation (intrinsic vs. extrinsic) and approach to learning (deep vs. surface)? Can you detect a relationship between high anxiety and learning?

- Principle 6:**
- A. Intrinsic motivation is associated with deep approaches to learning.
 - B. Extrinsic motivation and anxiety are associated with surface approaches to learning.

It is important to note that the approach to learning adopted by a particular learner does not represent a stable characteristic of that learner. Both the institutional context (i.e., departmental demands, exams, marking, teaching) and the personal context (i.e., intrinsic motivation, interest, prior experience, future goals) play an important role in determining the approach taken by a learner. Different learning materials themselves or even teaching styles or sessions may promote the adoption of different approaches to learning. Finally, high levels of learner anxiety are usually associated with a surface approach to learning.

Thus far, we have used the terms deep and surface approaches to learning without defining them to any great extent. By now, you should have a good grasp of these concepts based on the examples used. Below is a list of important characteristics of deep and surface approaches as they apply to a reading task—i.e., learning from reading (Ramsden, 1988, p. 19).

Deep Approach – the reader's intention is to understand, therefore he/she will:

- focus on what is signified (e.g., the author's argument);
- relate and distinguish new ideas and previous knowledge;
- relate concepts to everyday practice;
- relate and distinguish evidence and argument;
- organize and structure content;
- have an *internal* emphasis: driven by personal and immediate reasons for learning this content.

Surface Approach – the reader's intention is to complete the task requirements, therefore he/she will:

- focus on the signs (e.g., the text itself);
- focus on discrete elements;
- memorize information and procedures for assessments;
- unreflectively associate concepts and facts;
- fail to distinguish principles from evidence, new information from old;
- treat task as an external imposition;
- have an *external* emphasis: driven by the demands of assessments, knowledge cut off from everyday reality.

What then is your role as a teacher in encouraging learners to adopt a deep approach to learning? There is evidence in the literature that specific attempts to manipulate learning tasks in order to drive learners toward a deep approach to learning has the paradoxical effect of having them take on a surface approach (Marton & Saljo, 1984). Learners who use a deep approach when reading an assigned text have been found to interact with the text by asking themselves questions while reading (e.g., Can I summarize this section in one or two sentences? What is the relationship between sections? What are the main points?). When similar questions were used in an attempt to foster a deep approach to a reading task, the results were paradoxical: learners used a surface approach. It seems that the predictability of the "demand structure" was at fault; the questions themselves became the objective of learning rather than a means toward deep learning.

How then can you encourage your learners toward deeper approaches to learning without such a paradoxical effect? Focusing on motivation and the learning environment is key. You should nurture your learners' intrinsic motivation. You should also, as much as possible, reduce extrinsic motivation and learner anxiety.

The presence of intrinsic motivation has been associated with a deep approach to learning and spending more time on task (Ramsden, 1992). There is a synergistic and reciprocal relationship between intrinsic motivation and a deep approach. That is, the use of a deep approach while learning a concept, and the resulting understanding in itself results in increased intrinsic motivation. Intrinsic motivation may be stimulated by focusing on what is relevant to learners: specific interests, immediate real world concerns, prior experiences, future goals, etc. Highlighting positive growth and gains rather than deficiencies can have a similar effect. Even more importantly, providing learners freedom of choice in content and learning style is associated with a deep approach to learning (cf., vignette 2, student 2 writing an essay on a topic relevant to her interests and needs).

What about the engineering student attending the lecture (vignette 5)? How did you label his motivation (i.e., intrinsic or extrinsic)? What did you describe as the driving force? His motivation isn't truly intrinsic, in that it isn't from within. Yet, it isn't really perceived as an external pressure. His source of motivation can be thought of as vicarious (Hodgson, 1984). The student is experiencing interest, enthusiasm, and relevance vicariously through the teacher. There is evidence that vicarious motivation may be just as effective as intrinsic motivation in promoting a deep approach to learning. Vicarious motivation may be a bridge to intrinsic interest and motivation.

The learners in vignettes 1, 3, and 4 are preoccupied with the notion of evaluation (as was the comparative vertebrate anatomy student in the introduction to the chapter). The medical student in vignette 4 realizes that memorized facts are quickly forgotten (i.e., surface approach) but is faced with the conflict of wanting to do well on the test. Unfortunately, there is evidence that those learners who rely heavily on memorization for studying in medical school are overrepresented in the top quartile of the class and are thus being rewarded for adopting a surface approach (Regan-Smith, cited in Small et al., 1993). It would seem that the espoused theory and theory-in-practice of the medical school are at odds. Even when learners would prefer to use a deep approach, experience tells them that teachers often undervalue answers that are not close to verbatim reproduction of what they have been taught. It is argued (Ramsden, 1988) that "the most significant single influence on student learning is their *perception* of assessment" [*italics added*] (p. 24). Therefore, learners' perception of evaluation is the most important source of extrinsic motivation leading them to adopt a surface approach to learning. It is

important to note that it is learners' *perception* of evaluation and not the evaluation itself. For instance, the medical student in vignette 4 has not taken the internal medicine exam yet. For all he knows, it may very well require and reward a deep understanding of concepts. Unfortunately, this student's past experience with multiple choice type exams has left him with a perception of what is required (i.e., rote memorization). Therefore, teachers need not only change exam requirements, but also, they must alter the learners' perception of what is required of them.

A factor that may further aggravate the problem of perceived evaluation requirements is that of curriculum overload. Principle 4 informs us that a deep approach to learning takes time; the concept of "efficient" learning is not compatible with the Developmental Perspective. What happens when learners are given too much to learn in a given amount of time? By predicting and attending to the perceived demands of evaluation, learners can save effort and energy. Therefore, curriculum overload compounds the problem by providing another source of extrinsic motivation leading learners to adopt a surface approach to learning. Unfortunately the strategy is "penny wise and pound foolish"; learners are successful on exams but understand and retain little.

Now, consider Sam in vignette 6, anxiously waiting his turn to be questioned. How did you describe his approach to learning? You may argue that he was so anxious that no learning occurred at all; he was preoccupied with preserving his self-esteem. Interactive teaching and learning occurs in an ego-intensive environment where learners and teachers hate to say "I don't know" (Whitman, 1990). In an effort to preserve self-esteem, learners may try to hide areas of deficiency in understanding. It has been our experience that learners' prior experience with inquisition style questioning under the guise of the Socratic method leaves them uneasy with not knowing. Learners often mistake questioning as a method of teaching with questioning as a means of evaluation. Other sources of anxiety may come from past failure and lack of self-confidence. Anxiety may also be related to evaluation (cf., vignette 3, student studying for biology exam). It becomes easy to see how anxiety may inhibit learners from taking a deep approach to learning.

This brings us to an important question: Can you teach from the Developmental Perspective without also operating from the Nurturing Perspective? (See Chapter 7.) Conversely, can you teach from the Nurturing Perspective without also operating from the Developmental Perspective? We argue that both perspectives are closely linked and that one needs to operate from both to be successful in either. That is, one per-

spective becomes foreground while the other becomes background. The Nurturing Perspective is concerned with facilitating personal agency. There is a high regard for the learner's self-concept and a concern in developing the relationship between learner and teacher. One could argue that the goal is to help change learners' conception of themselves. This is accomplished in part by fostering a climate of trust and respect. Therefore, both perspectives focus on changing conceptions (i.e., understanding) in an atmosphere of trust and respect. To teach from the Nurturing Perspective requires helping learners change their self-concept. Similarly, to teach from the Developmental Perspective requires an ability to have learners want to take risks in an ego-intensive environment. As seen in vignette 6, learners may not engage in deep approaches to learning if the environment is not supportive of their self-concept. Therefore, successful teaching from the Developmental Perspective requires reducing learner anxiety by operating from the Nurturing Perspective in the background. Learners are more likely to engage in a deep approach to learning in a climate of mutual trust and respect. Learners know when teachers are genuinely interested in them; they can recognize a fake in 2 seconds flat. Further, by enhancing learners' self-esteem through encouragement and support, intrinsic motivation may be *nurtured* and therefore facilitate a deep approach to learning.

Finally, let's consider the student (vignette 2) who demonstrated no real interest in anthropology, and took the course because of the time slot and persuasion from his advisor. Extrinsic motivation is manifested by the way he approached the essay assignment. He can be distinguished, however, from the other extrinsically motivated learners in the other vignettes. The source of extrinsic motivation in the other learners can be ascribed to the "institutional context" (i.e., departmental demands, exams, marking, teaching). His extrinsic motivation is a result of "personal" context (Gibbs, Morgan, & Taylor, 1984). Learners undertake schooling or take courses for various reasons. Some may simply attend to be part of collegiate culture (i.e., sports and fun). Others may be focused towards gaining qualifications and employment or self-improvement. Finally, some may be stimulated by academic interest (i.e., intellectual interest). Given that teachers are driven by academic interests, they may be at odds with learners' personal contexts. It is unlikely that most, or even many, learners will be academically oriented; and teachers are unlikely to have a significant influence on learners' personal context. Therefore, teachers need to understand that there are some sources of extrinsic motivation over which they have little control. Be careful of la-

being a learner as lazy; reasons for taking different courses may vary. This person may in fact be academically oriented and intrinsically motivated in other areas.

Implications for teaching:

- (A) *Intrinsic motivation is associated with deep approaches to learning.*
- (B) *Extrinsic motivation and anxiety are associated with surface approaches to learning.*

Teachers should focus on nurturing intrinsic motivation, and diminishing extrinsic motivation and anxiety by:

- attending to what is relevant to learners;
- giving learners some control in learning;
- showing enthusiasm for their content area (i.e., vicarious motivation).

Teachers need to change learners' perceptions of evaluation demands as well as the evaluations themselves by:

- demonstrating how understanding and evaluation requirements overlap;
- avoiding curriculum overload (i.e., teaching too much content);
- Creating a safe place where learners can risk not knowing (c.f., Nurturing Perspective).

Attempting to manipulate approaches to learning should be undertaken with caution, as the predictability of the demand structure may have the paradoxical effect of encouraging a surface approach.

Principle 7: The Guiding Principle

Unlike the first six developmental teaching principles, principle 7 does not directly concern cognitive development and therefore does not build on the others; instead principle 7 "oversees" and guides the other principles by providing an ideal (cf., General Model of Teaching in Chapter 1). It is therefore not possible to provide you with a cognitive exercise to illustrate principle 7. Instead, a quote will introduce the ideal that guides the first six principles.

Thomas C. King . . . believes that the overriding purpose of education is to make the learner independent of any need for a teacher (1983). Dr. King contends that anything you do to build dependency is bad, and anything you do as a teacher to build independence

is good. Thus, he concludes that the teacher as an information giver is performing an immoral act! (Whitman, 1990, p. 85)

Although thought provoking, this comment is impractical and overly simplistic. Learner dependence-independence in learning does not exist as a dichotomy but rather as a continuum. Teaching from the developmental perspective, then, focuses not only on the development of the intellect, but also on movement along the continuum toward greater independence.

Teachers often burden themselves with the impossible task of teaching everything (or as much as they can) about their area of expertise. This is not only unrealistic but can be counterproductive in the long run (cf., principle 4). Instead, teachers should see themselves as occupying a brief but important role in the student's development, not unlike a pair of training wheels on a child's first bicycle. Anything we do that fosters learner dependence in learning counters our espoused theory of helping learners become independent self-directed learners. If we are working toward this end, we should feel increasingly unnecessary as our learners take charge of their own learning. Unfortunately, teachers may mistake the feeling of being needed with that of being helpful.

Principle 7: Teaching should be geared toward making the teacher increasingly unnecessary: that means, the development of learner autonomy as well as the intellect.

How then can we help learners become more effective and independent learners? Addressing this important and controversial question requires more space than can be provided in this section (see Candy, 1991, for an in-depth treatment). We will only provide you with food for thought and some general guidelines for practice.

It is often assumed that providing learners with opportunities to exert control over learning will ultimately result in greater learner autonomy. Learner control is an important and necessary condition, but not a sufficient condition for promoting independence. Providing learners with opportunities to exert control over learning is only the first step in fostering personal autonomy in learning. Other means are needed to complement and reinforce learners' independent efforts. One often neglected, but effective, way to foster learner independence is to make learning an object of reflection (Candy, 1991). Learners are usually so caught up in trying to learn the content of courses that they seldom consider the process of learning itself. Teachers need to help make learners aware of the

strategies and approaches used in learning (e.g., surface vs. deep). Further, they need to help learners recognize the relationship between the strategies used and learning outcomes. As mentioned earlier, context is all important in learning—the same applies to learning about learning. Therefore, the techniques for helping learners acquire such awareness should not be taught as a self-contained set of learning skills. Instead, they should be built into all subject matter being taught.

Perhaps the most important factor in promoting learner autonomy is helping learners believe they can. This aspect of developing learner autonomy is more likely the domain of the Nurturing Perspective. Either way, teachers need to encourage learners to believe in their own abilities. An important corollary is helping learners identify the sources of their successes and failures. Success should be attributed to hard work rather than luck or favoritism. Conversely, failure should be understood as resulting from lack of effort rather than lack of ability. It is now possible to appreciate that shifting control to learners is not sufficient for promoting autonomy in learning. Teachers holding to this misconception can unwittingly have an adverse effect on autonomy. For instance, learners thrown into the “deep-end” and required to fend for themselves may only end up learning that they are incapable of taking control of their own learning. The ideal of fostering learner autonomy in learning is not a call for “bootstrapism.”

From a practical perspective, teachers have three main ways of influencing personal autonomy in learning (Candy, 1991): (1) helping learners develop a sense of personal control (cf., Nurturing Perspective); (2) providing access to learning resources; and (3) helping learners develop the competence to take control of their learning. Some of the competencies that might be built into all subject matter being taught include:

- locating and retrieving information
- setting goals
- time management skills
- question-asking behavior
- critical thinking
- self-monitoring and self-evaluation

In reading principle 7—Teaching is geared toward making the teacher *increasingly* unnecessary: that means, the development of learner autonomy as well as the intellect—pay particular attention to the word “increasingly.” Above, we discussed the concept of the student’s “zone of proximal development” in terms of the complexity of content in learning

(principles 1 & 2). Similarly, each learner has a zone of proximal development in exerting independence in learning. The outer limit of this zone should be out far enough to challenge the learner but not so far as to cause frustration and self-doubt. Likewise it should not be too close as to bore the learner. Further, each learner will necessarily occupy a different place on the dependence-independence continuum. It is important to recognize that the dependence-independence continuum is represented as linear and unidimensional for the sake of conceptual clarity. It is actually better understood as multiple continuums each representing a different capacity or skill (e.g., goal setting; locating and retrieving information). Each learner will necessarily differ in amount and kind of autonomy in learning. As mentioned, throwing all learners into the deep-end may be detrimental in the long run in that it undermines the goal of helping learners develop a sense of personal control. Teachers should start by providing adequate *support* and *direction* in learning with the intention of slowly phasing these out as learners take greater control and responsibility for their learning (Pratt, 1988). The teaching skills of providing adequate support and phasing out are similar to the skills of scaffolding and fading discussed in the Apprenticeship Perspective of teaching. Different learners will necessarily start at different points on the continuum, move at different rates, and need different kinds of help on their journey toward greater independence in learning. Further, autonomy in learning is a situational attribute rather than a personal one. That is, learners may display varying amounts of self-direction depending on the specific content area and situation (Pratt, 1988).

Implications for teaching:

- Teachers should start by providing learners with opportunities to exert control over their own learning.

Teachers need to go further in promoting learner autonomy by:

- making learning an object of reflection.
- encouraging learners to believe in their own abilities.
- helping learners identify sources of successes and failures.
- helping learners develop the competencies needed to learn independently (e.g., goal setting).
- helping learners identify learning resources.

Teachers should provide the necessary *support* and *direction* to move learners along the dependence-independence continuum by:

- becoming aware of the types and range of independence in your learners.
- providing learning tasks that accommodate this range and allow for different rates of progression and different endpoints.

Now that you are familiar with the seven Developmental Teaching Principles, we will consider the special knowledge needed to be a good developmental teacher.

BRIDGING KNOWLEDGE: TEACHERS' SPECIAL KNOWLEDGE

Consider the following examples:

A student is attending a seminar as part of her course work. The seminar leader is enthusiastic. He tries to engage her. He asks questions. She just doesn't seem to understand. The harder he tries, the more confused and frustrated she becomes. He obviously knows his stuff; he just can't get her to understand. She leaves feeling that she understands less than when she came in.

What characterizes gifted and inspired teachers? Do they have a better understanding of their subject area? Do they use more effective teaching behaviors? If not, what specialized knowledge and skills distinguishes them?

To view and assess the quality of teaching in terms of methods and techniques is simplistic and narrow; unfortunately this has been the focus of much research in adult teaching. Moreover, this instrumental view provides insight into the assumptions that underlie the teaching and learning relationship. These assumptions include the beliefs that effective teaching or specific methods are necessarily related to (and responsible for) learning, and that a focus on improving teaching behaviors (i.e., skills) will therefore result in better learning. If learning does not improve, blame is usually placed on the learner. This limited view of teaching denies the complexity of learning and its emphasis over teaching. It also reduces teaching to a decontextualized set of effective teaching behaviors.

The idea of generic and transferable teaching skills is of limited usefulness; the separation of content and process is artificial. You can't just teach; you have to teach something. Unfortunately, much research has

been preoccupied with what teachers need to do rather than what they need to know. From this perspective, the teacher's role is that of installing or implementing the curriculum. A more useful idea is that of teachers occupying an important place between the curriculum-as-plan and the curriculum-as-lived experience (Aoki, 1991). The teacher's role, then, becomes one of interpreting the curriculum plan into meaningful experiences from the student's viewpoint. It is this ability to serve as bridge or translator, we argue, that separates gifted and inspired teachers from merely adequate teachers.

Consider the similarities between a teacher as interpreter and a language translator as interpreter. The ability to translate from English to Japanese requires more than a knowledge of translation. It requires a special ability to translate *that specific language*. You cannot separate the skills of translation from the language itself. You cannot simply translate; you must translate something. Otherwise, the special translation skills would be transferable to another language. Further, translation has to do with understanding and getting a message across. The focus is on meaning rather than the elements of speech or text. For instance, "Boys' night out" has nothing to do with male children playing outside in the evening.

Therefore, to teach from the Developmental Perspective is to act as a bridge from the curriculum-as-plan to the curriculum-as-lived by the learners. It requires more than subject matter expertise (i.e., content expertise); special skills in translation are required. However, translation skills are content-specific; they cannot be usefully separated from the subject area. Finally, the primary focus of translation is to get the message across—i.e., focus on learners' understanding.

The special "bridging knowledge" (Pratt, personal communication, May, 1995) required for translation of subject matter into learner understanding is also known as "pedagogical content knowledge" (Wilson, Shulman, & Richert, 1987) or "content-specific pedagogy" (Reynolds, 1992). It occupies an important place among the other types of knowledge used by teachers: knowledge of content area, knowledge of other content, knowledge of curriculum, knowledge of learners, knowledge of teaching and learning process. Unfortunately, bridging knowledge has been neglected until recently. More emphasis has been placed on content expertise (i.e., subject matter expertise) and process expertise (i.e., expertise in the general principles of teaching).

Content expertise is necessary but not sufficient for becoming a good teacher. The seminar teacher in the example above "knew his stuff" but

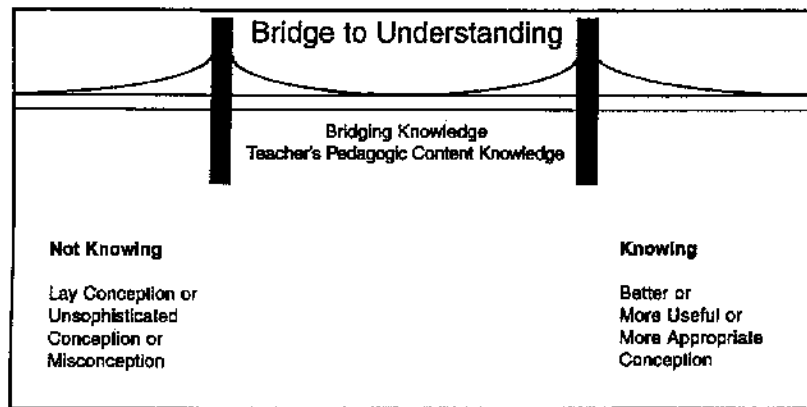


Figure 6.2 Bridging Knowledge: Moving Students from “Not Knowing” to “Knowing”

was unable to communicate it to others. On the other hand, a process expert, unfamiliar with the content area, is just as unlikely to promote learner understanding. Bridging knowledge is the knowledge needed to transform the content for the purposes of teaching: “We use the general term ‘transformation’ to designate the set of activities engaged by the teacher to move from her own comprehension of a matter, and the representations most useful for that understanding, to the variations of representation, narrative, examples, or association likely to initiate understanding on the part of the student” (Wilson, Shulman, & Richert, 1987, p. 113). It is no longer useful to think of effective teaching as a two-sided coin comprised of content expertise and process expertise. A place must be created for bridging expertise.

Teaching from the Developmental Perspective has to do with helping learners cross the bridge to understanding: the bridge from “not knowing” to “knowing.” More importantly, teachers help learners cross the bridge to knowing differently: the bridge from “lay conceptions/unsophisticated conceptions/misconceptions” to “better/more useful/more appropriate conceptions.” Teaching from the Developmental Perspective assumes a knowledge of learners’ starting points (existing conceptions—less sophisticated or misconceptions), a knowledge of where you want to take them (better or preferred conception(s)), and a knowledge of effective routes for the transition (i.e., bridging knowledge). (See Figure 6.2.)

The seminar teacher in the first example was lacking in bridging knowledge and is not unlike many experts who have difficulty teaching. Content experts or other people with subject matter expertise sometimes have difficulty with the unthinking of an idea or concept which has become commonplace or reflexive for them (Marton, Hounsell, & Entwistle, 1984). These teachers can’t remember not knowing and therefore make assumptions about what learners know and don’t know. These assumptions are usually not conscious in that they are usually taken for granted. A similar phenomenon can occur when lecturers don’t interact with their learners. As their content expertise increases over the years, they become increasingly less able to communicate their understanding to learners; they no longer speak the same language.

Our discussion about bridging knowledge so far has been somewhat vague and theoretical. Unfortunately, there is no way around this. Bridging knowledge is very specific—not only to a content area, but also to specific learners. The knowledge needed to make nuclear physics understandable to first-year university students is necessarily different from that needed to make anthropology understandable. Further, the knowledge needed to transform the content of respiratory diseases into learning will be different for medical students, nursing students, and respiratory therapy students. Even the same learners will require different representations of knowledge at different levels of training. First-year medical students will have different needs than medical interns and residents.

Although we cannot be more explicit in our discussion of bridging knowledge, we can make some general comments to help guide you in the development of bridging knowledge for your specific subject area and your specific learners. When reading each of the points below, search for examples from your experience as a teacher in a specific content area.

- Become familiar with:
 - the usual range of learners’ conceptions and misconceptions;
 - the teaching strategies, methods, and activities that make your content more understandable;
 - the progression and changes in learners’ conceptions over time;
 - the “sticky points” and conceptual stumbling blocks that slow learners’ understanding and require special attention and extra time;
 - the appropriate pace for introducing new and more complex concepts. Watch for cues from learners that your pace is too slow or too quick.

- Learn to choose, adapt, and use curricular materials that facilitate understanding in your content area.
- Develop, collect, and use analogies, anecdotes, metaphors, and examples that are striking and provide insight.
- Develop the capacity to introduce variations on a theme: alternative representations of your subject matter. That is, develop a representational repertoire for the subject matter you teach (Wilson, Shulman, & Richert, 1987).
- Learn to juxtapose elements in order to provide your learners with an “Aha!” or “Eureka!” experience.
- Speak the same language as your learners; don’t make assumptions about what they know and don’t know.
- Sequence your teaching to promote understanding. A good starting point is common sense and everyday experiences moving to abstraction, then back again to the application of theory in practice.
- Maintain a balance between the “big picture” and the “elements” in your presentations. Bring the focus back to the big picture before introducing the next element.
- Don’t burden yourself with providing a complete understanding of concepts all at once. Sometimes “white lies” are OK. Simplified or incomplete representations may be appropriate depending on learners’ level of understanding and sophistication. Think of these as “transitional” representations. Increasing levels of complexity can be added in layers, as learners master each level. For instance, having first-year medical students think of the heart as two pumps in series is a good first approximation of a difficult and complex concept. A common mistake made by many content experts who teach is to deny the importance of transitional representations. They confuse transitional representations with misrepresentations and misinformation. They err on the side of comprehensive coverage of concepts and usually confuse learners.

Those of you with considerable teaching experience can probably think of examples for each of the points above. Those of you with less experience may need to rely on your experience as learners for insight. Our goal has been to provide you with a framework for interpreting and understanding the special knowledge that enables you to transform your content for the purposes of teaching.

Experience will play an important role in the development of your

bridging knowledge. Experience is necessary but not sufficient in developing bridging knowledge expertise. Ten years of experience without reflection is just 1 year’s experience repeated nine times. Teaching should be a reflective, thinking activity (Calderhead, 1987). Unfortunately, many teachers are “surprisingly unreflective about their work” (Ashton, 1984, p. 31). Reflection will enable you to learn from your experience as a teacher. Recall that teaching from the Developmental Perspective has to do with helping learners cross the bridge to understanding. Reflection on your experience will help you in refining the routes and creating alternative routes (i.e., expand your representational repertoire). Make reflection a routine part of your work as a teacher. Questions to ask yourself after a teaching session might include the following:

- What worked? Why?
- What didn’t work? Why?
- Was the sequencing of material appropriate and helpful?
- Was the pace appropriate?
- What would you do the same next time?
- What would you do differently next time?

TEACHING FROM THE DEVELOPMENTAL PERSPECTIVE: EXAMPLES FROM PRACTICE

The developmental teaching principles and bridging knowledge can be interpreted in an infinite number of ways. We would like to present a few examples of how these might be played out in the teaching moment.

The first example comes from Eleanor Duckworth’s work with children, while doing research with Piaget in the 1950s, and presents a key idea underlying the Developmental Perspective (Eleanor Duckworth, 1987).

With a friend, I reviewed some classic Piagetian interviews with a few children. One involved the ordering of lengths. I had cut 10 cellophane drinking straws into different lengths and asked the children to put them in order, from smallest to biggest. The first two 7-year-olds did it with no difficulty and little interest. Then came Kevin. Before I said a word about the straws, he picked them up and said to me, “I know what I’m going to do,” and proceeded, on his own, to order them by length. He didn’t mean, “I know what

you're going to ask me to do." He meant, "I have a wonderful idea about what to do with these straws. You'll be surprised by my wonderful idea."

It wasn't easy for him. He needed a good deal of trial and error as he set about developing his system. But he was so pleased with himself when he accomplished his self-set task that when I decided to offer them to him to keep (10 whole drinking straws!), he glowed with joy, showed them to one or two select friends, and stored them away with other treasures in a shoe box. (p. 1)

Compare Kevin's experience with that in the example below.

Ric: I recently took a Coastal Navigation course to improve my sailing skills. The sessions consisted mainly of noninteractive lecturing followed by the application of concepts as chartwork: plotting a position on a chart, a course (i.e., direction), speed, etc. The teacher was explaining the procedure to sort out how far off course the boat drifted after sailing for a while. I then had a thought, "Hey, once you have this information, you could actually correct ahead of time and end up on course." More than pleased with my insight, I lifted my hand, and proposed this idea to the teacher. "Uh huh," he said, annoyed by the interruption, "we'll get to that in a few minutes." I learned to keep my special insights to myself.

According to Duckworth, the "having of wonderful ideas" is the essence of intellectual development. The essence of good teaching then, is to provide occasions for having wonderful ideas and to let learners feel good about having them. There are two important concepts here: first, the notion of providing opportunities; second, the notion of allowing learners to feel good. The thing about wonderful ideas is that they may not seem all that wonderful to others—including teachers. You need to be aware of and vigilant for unexpected insights in your learners. Share in your learners' joy of discovery. Again, notice the important overlap of the Nurturing Perspective.

Before moving on to some specific examples, we want to drive home one more message: specific techniques (i.e., actions) don't belong to a particular perspective of teaching. Behaviors that appear superficially similar may in fact be informed by contradictory intentions and beliefs, and therefore have totally different learner outcomes. For instance, lecturing per se does not equate to transmission. It is possible to lecture

from the Developmental Perspective (as well as the other perspectives), and we provide some tips on how to do so in a section below. Questioning (also discussed below) can be approached from different perspectives (or with disregard to some). For example, questions may be asked to assess factual recall (i.e., if a piece of information was transmitted and received). Questions can be posed to activate prior knowledge and promote linking between elements. Also note that bad experiences with inquisition style questioning under the guise of the Socratic method can leave learners uneasy with not knowing and less likely to engage in future discussions (i.e., this approach violates the Nurturing Perspective). Therefore, don't confuse a teaching technique with a particular perspective.

We will now provide some examples of the Developmental Perspective at work. The sections below are not meant to provide an exhaustive analysis and discussion; they are simply meant as illustrations and suggestions for implementing the Developmental Perspective in your work as a teacher.

The "10-2" and Its Variants:

The Developmental Perspective and Large Group Teaching

One of the criticisms lodged against the Developmental Perspective of teaching is that it is difficult to implement with large groups; we disagree. If you review the seven Developmental Teaching Principles and the summary points of "teachers' special knowledge" (i.e., bridging knowledge) we are sure that you can come up with endless possibilities for your specific context.

At the risk of overstating the obvious, we suggest that the Developmental Teaching Principles and the main points summarizing pedagogic teaching knowledge be used in precisely this way: review them while asking yourself the question, "How does this apply to a *specific context*?"

Other ways of implementing the Developmental Perspective for large group teaching that we have found successful are the "10-2 lecture" (Rowe, 1983, cited in Small, 1993) and its variants. Of note, the idea of the 10-2 lecture is informed by the Transmission Perspective of teaching. We have simply slanted the technique toward the Developmental Perspective. The technique is simple. Approximately every 10 minutes the audience is invited to discuss a question in groups of two or three for 2 minutes. The purpose, from a Transmission Perspective, "is to clear short-term memory so that *incoming information* can again enter and be *transmitted* from short-term to long term memory" [italics added]

(Small, et al., 1993, p. S89). The intentions for using the variants of the 10-2, from a Developmental Perspective, include the following: actively involving learners in constructing personal meaning, elaboration (i.e., time = links), and activation of prior knowledge. Here are some variations of the 10-2.

- Have groups of two to three learners explain to each other what they have understood from the key concepts presented in the prior 10 minutes.
- Throw out an “understanding” question and have the learners explain their answers to each other.
- Throw out a question relating to what will be presented in the next 10 minutes in order to activate prior knowledge or unmask common misconceptions.

A related technique can be used to connect a subsequent lecture.

- Leave 10 minutes at the end of a lecture. Invite learners to write a question requiring evidence of having understood the lecture content.
- Have the learners pose their questions to each other in groups of three.
- Have them select and submit the best of the three questions.
- You can collect/evaluate/collate the questions and provide a copy for the learners to use as a learning tool. Perhaps you could include a comment on misconceptions that become evident as you review the questions.
- Alternatively, you could use these questions for evaluation. Informing learners of your intention to do so could have interesting (and useful) results. Imagine learners collating and sharing the questions, as well as discussing and debating “right answers” in preparation for the exam. This should encourage a deep approach to learning by changing both the demands of evaluation and the students’ perception of the demands (see principle 6).

Perhaps now you are starting to get a better appreciation of one of our earlier statements: teaching from the Developmental Perspective is Machiavellian: “the ends justify the means.” You can also see why we are skeptical of prescriptive how-to manuals for teaching. The idea that effective teaching behaviors can be listed and learned is limiting. The possibilities (the means) for promoting learners’ understanding (the ends) are limitless! Allow your creative imagination and your specific context to collide and you will come up with an explosion of ideas for implementing the Developmental Perspective in your practice.

Don’t Tell Them: Let Them Figure It Out.

“Remember: Don’t tell them, let them discover. What we discover for ourselves lasts a long time; what we are told vanishes into our notes. One carries *meaning*; the other does not” [italics added] (Bateman, 1990).

Walter Bateman (1990), in his book, *Open to Question*, suggests simply starting with data. He provides an example used to help students discover assumptions about race. He starts with the data first. He asks one student to read the metaphorical meanings for the word “white” from the dictionary, while another writes them on the board.

White: free from spot or blemish; free from mortal impurity; innocent; marked by upright fairness; not intended to cause harm; favorable; fortunate; conservative or reactionary.

He then switches to the metaphorical meanings of the word “black.”

Black: thoroughly evil; wicked; soiled; dirty; invoking the devil; gloomy; calamitous; sullen; hostile.

“ . . . you need ask no questions. Wait. Listen. The comments will begin long before the list is finished. The class will teach themselves . . . ” (p. 97)

Bateman’s technique is simple but effective in providing an opportunity for your learners to have “wonderful ideas.”

- Start with data.
- Stand aside.
- Let them discover.

When you feel they are taking too long and feel you should intervene—don’t. Give them even more time.

Ric: I use this technique a lot when teaching on the hospital wards in small groups. Medical teachers often quote the literature while reviewing patient cases. They fail to appreciate the difference between quoting the literature and interpreting it (as do their students). For instance, a team of six physicians-in-training (i.e., learners) and I were reviewing a patient with AIDS. One of the students asked me what the recommendations were for using AZT (a medication) in these patients. Rather than providing them with a cook-book list of recommendations, I presented them with a synopsis of the results

from a couple of landmark studies and asked them to make recommendations for treatment based on them. Two students came up with conflicting recommendations. They were each asked to defend their point of view. The others joined in the debate on how to apply these study results to clinical practice. Interestingly, the two conflicting recommendations proposed by the students were in keeping with an existing dilemma being debated in the medical literature.

Asking Questions from a Developmental Perspective

The outcome of using questioning as a teaching technique will depend on the intentions for asking questions and the types of questions asked. Intentions for asking questions from a Developmental Perspective include the following:

- assessing prior knowledge
- activating prior knowledge
- helping learners structure knowledge—i.e., make links within and between subjects
- probing for understanding
- providing opportunities for the “having of wonderful ideas”

We see two main errors when teachers use questioning as a teaching strategy. The first is obvious and requires no explanation: asking learners questions that demand simple recall. The second error is the way teachers handle learners’ right and wrong answers. Learners’ wrong answers provide a window to learners’ misconceptions. It becomes more important to discover the faulty reasoning behind a student’s wrong answer than to replace it with the correct one. By investigating wrong answers, teachers can map out learner deficiencies, inconsistencies, and misconceptions. Similarly, it is important for teachers to probe for supporting evidence of learners’ correct answers. Teachers may be surprised how often learners get “the right answer for the wrong reason” or how often learners are simply parroting answers with no clear understanding. White and Gunstone (1992) indicate that questions beginning with “Why,” “How,” and “What if” are more likely to probe understanding, whereas, questions beginning with “What,” “Who,” “Where,” and “When” are more likely to test recall. How often do you ask “Why,” “How,” and “What if” in your teaching?

You should send a clear message to learners that *all* of them are required to think, not only the learner to whom a question is posed. Fur-

ther, you shouldn’t turn off learners’ thinking by accepting or critiquing the first answer given by a learner. Not all learners think at the same pace. Some may require a little more time to come up to speed. We have found the following follow-up questions useful to both these ends. Redirect the focus of discussion to another learner (or the group as a whole) by asking one of the following questions in follow up to a learner’s response:

- What do you think of that answer?
- Do you agree?
- Why is it right?
- Why did I ask that question?
- You’re nodding your head (in agreement to another student’s answer). Explain the answer for us.

It’s important that you not use these follow-up questions only when the first learner is wrong. Otherwise learners will pick up on this cue and not commit to their answers.

We often think of good teaching in terms of the presence of facilitating teaching behaviors (i.e., doing it well). We fail to appreciate the equally important concept of the absence of “non-facilitating teaching behaviors” (i.e., not doing it badly) (Napell, 1976). Below we list 6 behaviors that you should avoid while asking questions. For each of these behaviors, use the concepts presented above and the Developmental Teaching Principles to explain how they might inhibit learning. Also, suggest more appropriate ways of dealing with each situation.

1. Insufficient wait time—i.e., not waiting long enough after asking a question.
 - This behavior inhibits learning because. . . .
 - A more appropriate way of dealing with this situation is. . . .
2. Teachers answering their own questions.
 - This behavior inhibits learning because. . . .
 - A more appropriate way of dealing with this situation is. . . .
3. Rapid Reward—i.e., accepting and rewarding the first answer given (e.g., right or good, etc.).
 - This behavior inhibits learning because. . . .
 - A more appropriate way of dealing with this situation is. . . .
4. Nonspecific feedback questions—e.g., “Does everybody understand?” or “Are there any questions?”

- This behavior inhibits learning because. . . .
HINT: What the learner hears: "Is there anybody stupid enough to admit they don't understand?" (compare Nurturing Perspective).
 - A more appropriate way of dealing with this situation is. . . .
5. Teacher "ego-stroking" questions—i.e., questions to which only the teacher could possibly know the answer asked to show how much the teacher knows (and how little the learners do).
- This behavior inhibits learning because. . . .
HINT: compare Nurturing Perspective
 - A more appropriate way of dealing with this situation is. . . .
6. Fixation at a low level of questioning—i.e., asking questions that only demand factual recall.
- This behavior inhibits learning because. . . .
 - A more appropriate way of dealing with this situation is. . . .

SUMMARY

We won't bore you by repeating and summarizing the main points in this chapter. If you're interested in doing so, just go back and read all the bullets. Instead, we want to present you with an argument: all learning (not just that associated with teaching) follows the key points outlined in this chapter. Reflect on your experience as a reader of this chapter (i.e., learning from reading). If we have done a good job of presenting the material in this chapter, several examples of the seven Developmental Teaching Principles will come to mind. For instance, we often introduced new concepts with examples from everyday experiences (e.g., activation of prior knowledge). We required active engagement with the text to promote the construction of personal meaning. We also spent a lot of time (cf., more links = more time) approaching concepts from several angles rather than simply stating things once.

We don't take credit for the concepts presented in this chapter as they are not our original thoughts but the work of many researchers and practitioners. We do, however, take credit for its representation. We can now cite a specific example of bridging knowledge (i.e., pedagogic content knowledge). We could have simply listed the seven Developmental Teaching Principles and provided brief explanations. We chose instead to represent the ideas using examples, anecdotes, analogies, and metaphors that we thought would be helpful in promoting understanding. We as-

sumed (perhaps wrongly) that you would not have an extensive understanding of these concepts before starting and we sequenced the material in such a way that demanded an increasingly sophisticated understanding. Only you can determine how successful we have been in transforming the words and ideas of others for your learning. Finally, we hope to have provided you with opportunities for the "having of wonderful ideas." We tried to let you figure it out as often as we could. Our main goal was to have you *understand*, which is the main focus of the Developmental Perspective. We hope to have convinced you of the strengths of this perspective by having you experience it. Hopefully, you will try to apply some of our ideas to your own context.

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