My Discipline-Specific Applications

Structure/Activity/Assignment	Ways I Could Use It

Critical Incident Writing Exercise

(Activity that Could be Given as a Pre-Class Assignment)
[Think/Write]

Think of a learning experience in which you were involved where everything "clicked," a time when you felt empowered as a learner. <u>Or</u>, think of a learning experience where there was a "disconnect," a time when you felt helpless or frustrated as a learner.

<div align="right">--after Brookfield, 1990</div>

Individual Reflection/Writing

Briefly describe the successful or the unsuccessful learning experience. Why was it satisfying or dissatisfying to you? What contributed to your success as a learner or your failure to learn?

Pairing
(In-Class "Processing" Activity to Promote Active Learning and Student-Student Interactions)
[Pair]

Turn to someone sitting near you and discuss your two learning experiences. Working together, try to derive at least one learning principle from each experience. (<u>e.g.</u>, "Helping students believe they will succeed motivates them to learn"; "Neophyte learners need to rehearse complex procedures under low risk conditions"; "Old misconceptions can get in the way of new learning.")
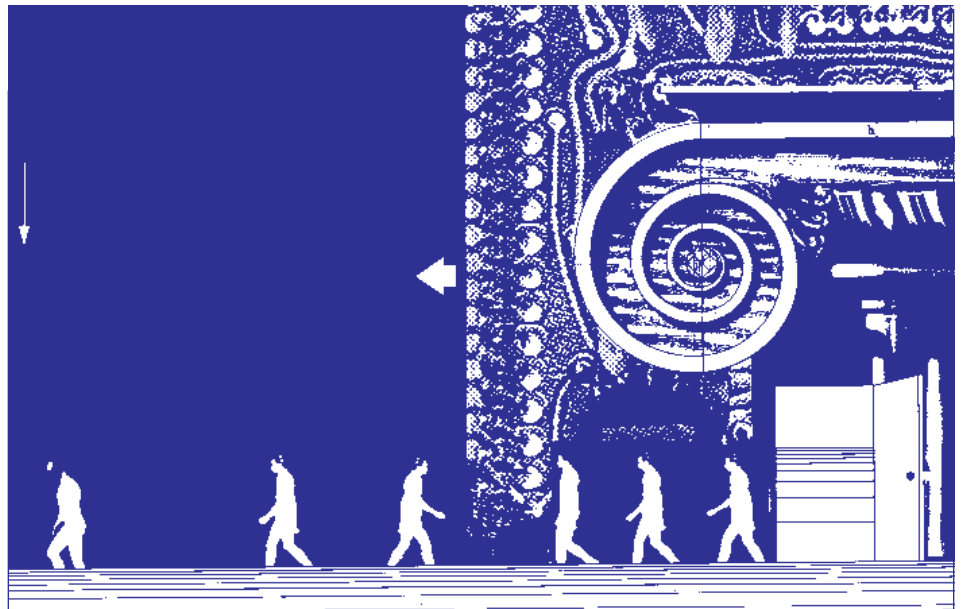
Learning Principles:

Feedback
(In-Class Feedback Allowing Students to Assess Their Learning)
[Share]

With your partner, quickly review Tom Angelo's "Teacher's Dozen," to see if they match any of the learning principles you identified.
Prepare for a whole class response by writing your learning principle with its connection-- if any--to one of Tom Angelo's "Teacher's Dozen."

Deep/Surface Approaches To Learning: An Introduction

James Rhem, Executive Editor

In the United States, the phrase "learning styles" commonly accompanies discussions of personality differences. These discussions almost always create a kind of short-term, local excitement, but they tend to exaggerate the correlations between individual personality types and cognitive engagement. As Wilbert McKeachie pointed out in the last issue of *The National Teaching and Learning Forum,* the best validated conceptions of learning styles stem instead from research begun in Sweden in the mid-1970s by Ference Marton and Roger Säljö.

In the last twenty years, this line of inquiry (in which the idea of "styles" emerges as secondary to a larger preoccupation with "approaches" to learning) has been pursued by many researchers working in a variety of countries. The research has looked at thousands of students studying in over 40 disciplines. Repeatedly, it has found fundamental patterns in studying and learning behavior as it actually occurs within the contexts of university education.

Probably the most influential finding of the original experiments, the researchers say, was what they describe as an "obvious aspect of learning virtually ignored by earlier research." And that was the fact that many students did not get the point of what they were reading "simply because they were not looking for it."

What were they looking for? They were looking for the **facts** they thought they would be tested on. They were not looking for the **meaning** of the text. In a sense, for them, at least as they perceived the situation, the meaning of the text stood in direction relation to the way they expected to be **assessed**. They were taking what has become known as a "surface approach" rather than a "deep approach" to learning.

Alarmingly, studies in Australia suggest that students progressively drop a deep approach to learning as they move through high school and college. It appears that in many ways, traditional teaching pushes students toward superficial levels of engagement with material, even as it hopes to do the opposite. Why? To find out these researcher put students and a qualitative look at what they thought they were doing in studying at the center of their work. They avoided questions such as "Do introverts learn mathematics more easily than extraverts?" or "Why are some teachers more effective than others?" Instead of asking "how" and "why" questions, they've concentrated on "what"

questions: "What does it take to be good at learning from a text; to learn arithmetic; or to be an effective teacher?"

The shift toward a fuller understanding of learning phenomena in context involves an inquiry into the meaning of the underlying human actions involved. Instead of projecting laboratory ideas about learning onto real-world settings, and rather than assume that "output" or achievement equalled intelligence, they've approached students, observed their actions and listened very carefully as they described how they actually went about studying in particular situations. In the end, they have focused on meta-cognition as the heart of

> Many students did not get the point of what they were reading "simply because they were not looking for it."

learning and view it as a phenomenon more influenced by the demands of particular learning environments than by predispositions of personality.

The research does not boil down into an easy or mechanistic answer to the challenges of good college teaching precisely because it shows very clearly how learning and teaching must be considered in relation both to the content and the context of the teaching. But repeatedly, Ference Marton (Sweden), Noel Entwistle (Scotland), Paul Ramsden (Australia) and a host of colleagues have found the same patterns emerging, patterns which have strong implications for making teaching in college effective.

For example, the same student may take a deep approach in a humanities class, where it seems to be demanded, and a surface approach in a science class where just grabbing the facts and formulae seem to equal academic success.

Indeed, the very way in which these researchers, in dialogue with one another, moved toward the term "approach" and away the term "process" indicates how inseparable an awareness of context is to their insights into how students learn. "Approach," they feel, embraces a sense of the student's **intention** in taking up a learning task as well as **how** he goes about the task (processing it).

Intention emerges as perhaps the dominant idea in the pair (if one must dominate), because the **hows** of learning necessarily vary. And this is where the deep/surface approach literature takes up the idea of *learning styles*, not in terms of fixed traits or unyielding attributes of individual students, but in terms of cognitive (and social) **orientations** within deep or surface approaches to learning. It's true that the **hows** do vary in response to personal preference, habit, and personality as we are accustomed to thinking in the United States. But they vary more in response to a student's **perception** of particular contexts and the **intention** she forms as a result.

Students build toward understanding in one of two general ways. Some draw a quick mental sketch of the material to be grasped, using analogies, metaphors, and ties to personal experience, and then fill in and alter that framework as they acquire more and more detailed information. Others build up a framework piece by piece only as they acquire knowledge of the details. The first approach roughly describes what the researchers call *comprehension learning*; the second describes *operations learning*. Both are necessary — on both *global* and *local* levels — to develop real understanding.

Social orientations also affect student learning. Research at the Oxford Polytechnic and the Open University found four general social orientations: **academic**, **vocational**, **personal**, and **social**. Each of these also differed in response to the amount of extrinsic or intrinsic motivation students felt.

When faculty see vocabulary multiplying this way, they often feel an inner resistance, as though they

Editor's Note:

A doppelganger hangs over this issue, the teacher's teacher. I see it everywhere asking: "What are you about?" Troubling, confusing as it may be at times, it is the question that compresses the spring, gives animation to work, makes us want to know. Toward the end of my interview with software author **Neil Larson** (profiled in this issue) he was speaking with great enthusiasm about how he felt Aristotle's emphasis on classification led to more knowledge and insight than Socrates' emphasis on questions. Classifying forces one to confront the edges, he said, and at the edges insights spring up. I thought, 'Yes, . . but what makes one want to classify in the first place." We agreed it's the question.

We need both, of course — the impulse and the method, the hunch and the proof. The stories in this issue all show teachers asking what they're about. They show something more as well; they show them listening with care for the answers. "Listening," "care" create a sacred space between the question and the answer. Their held breath contains the guardian impulse that says "Wait." Together they make room for reflection before method springs up, so eager to answer. It's the quality I see it in the research into **deep/ surface approaches** to learning. Listen to Ference Marton answering one of my queries:

"In our recent micro analyses of the learning process we have discovered that there is a brief initial phase of learning, a kind of general understanding of the whole of that which is to be learned. This experienced whole is necessarily very vague and undifferentiated to begin with. As you go on, the different parts derive their meaning from the sense of the whole. At the same time, the parts contribute, determining the whole in more and more differentiated, integrated and precise ways. The whole and the parts thus mutually consittute each other in the process of learning. But the whole is slightly, very slightly, preceding the parts. The reason is, of course, that you can not learn anything without having an idea of what you are learning about."

The sense of the poetry in learning runs right through **David Brakke**'s case study and the responses from **Bruce Perry** and **Wendy Luttrell**. It's the force that makes **Richard Burnor** dream of giving students a tool to help them think, and made **Horace Rockwood** broker a marriage between contending views of knowledge. Learning and teaching require many things, but none more than this faithful pause.

— James Rhem

were being asked to become part of a new religion. I know because I feel that way myself. But having pushed through and read a great deal of this research now, I've come away with a sense that some fundamental dynamics of the learning-teaching dance are being laid bare. The simple dualism — "deep/surface" — which sounds superficial, even judgmental at first, ends up representing a highly complex and empathic view of real-world learning. As these researches have kept on listening systematically and closely to what students have to say, their work is transforming what might be described as *folklore and prejudice* about how student are and how they learn into *principles of understanding*. And as understanding grows, so, often, does vocabulary.

For me this vocabulary has not been without humor and the insights humor brings. For example, one early researcher talks of "holist" and "atomist" approaches rather than "deep" and "surface." Confronting the problems of students' indulging in either extreme, he begins to speak of "globetrotting holists" and "improvident serialists." The temptation to type and stereotype is so strong, it crops up even in resolutely systemic and contextual thinkers. But the point is clear: Facts are dust unless they lead to understanding; but theories are fantasy unless they remain awake to the facts. The implications for faculty are also clear: teach toward understanding, not grades. How to translate that trusim into action is the subject of the accompanying sidebar. (page 4.)
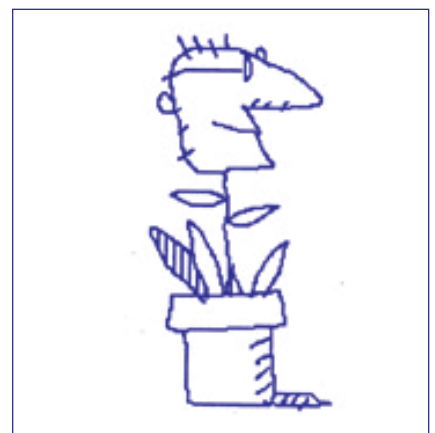
Going Deep

What are the characteristics of courses that incline students toward a surface approach? Here's a list:

An excessive amount of material in the curriculum

Relatively high class contact hours

An excessive amount of course material

A lack of opportunity to pursue subjects in depth

A lack of choice over subjects and a lack of choice over the method of study

A threatening and anxiety provoking assessment system

In e-mail dialogue this fall, Marton, Entwistle, and Ramsden all emphasize the primary importance of an assessment system that truly reflects the level of understanding faculty want students to achieve. If students feel called upon to reproduce information rather than make sense of it, they will see teaching and learning as **"closed" processes** with short-range aims and outcomes.

But while it is possible to structure "learning environments" (a phrase meant to emphasize the interaction of departmental and campus climate as well as curriculum, course design and so on) that encourage a deep approach, it can be tricky. In some experiments designed to foster deep engagement, students merely "technified" the probing questions and adapted themselves to a new way of parroting the "right" answer.

Ramsden — writing from Australia — emphasizes the delicate balance needed: "It isn't so much the specific teaching and assessment methods you use that make the difference to the quality of student learning, but the reasons why you use them and the *way your students*

perceive them. The key thing to understand about approaches is that they arise from the student's *perception* of the teacher's requirements."

Faculty are instrumental in forming those perceptions, he says, because research indicates that different forms of teaching are perceived differently by students, and thus tend to elicit different approaches.

The list of features associated with surface approaches given above implies alternative strategies. Specific implementations prove as various as contexts and learners. Four key classifications, however,
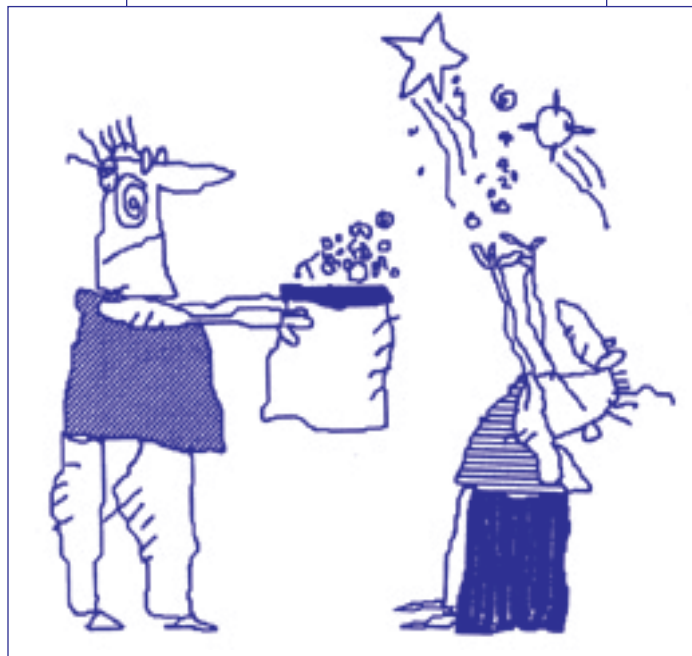
offer a check list of general features to consider in developing strategies and cultivating environments which help deep approaches thrive.

Motivational context: We learn best what we feel we need to know. Intrinsic motivation remains inextricably bound to some level of choice and control. Courses that remove these take away the sense of ownership and kill one of the strongest elements in lasting learning.

Learner Activity: Deep learning and "doing" travel together. Doing in itself isn't enough. Faculty must connect activity to the abstract conceptions that make sense of it, but passive mental postures lead to superficial learning.

Interaction with others: As Noel Entwistle put it in a recent e-mail message, "The teacher is not the only source of instruction or inspiration." Peers working as groups enjoin dimensions of learning lectures and readings by themselves cannot touch.

A well-structured knowledge base: This doesn't just mean presenting new material in an organized way. It also means engaging and reshaping the concepts students bring with them when they register. Deep approaches, learning for understanding, are integrative processes. The more fully new concepts can be connected with students' prior experience and existing knowledge, the more likely it is they will be impatient with inert facts and eager to achieve their own syntheses.

In many ways — as Ference Marton suggests — this tide of research ends up affirming the primary importance of helping students learn how to learn, how to study, how to know themselves as learners. Study skills courses, however, do not do that; cultivating this awareness must become part of coursework itself. Students after all do not learn in the abstract, they learn *something*. Their approach — deep or surface — doesn't represent intelligence or character (or personality). It represents a *relationship between* the student and what he or she is trying to grasp.

On the encouraging side, Marton and Noel Entwistle join Ramsden in speaking of the importance of group work and problem-solving as means to fostering a deep approach. In the United States, these elements of reform have begun to have influence under various banners — "active learning," "cooperative learning," "problem-based instruction" — though, as yet, they seldom appear as part of a systemic and integrated approach on most campuses.

RESOURCES

Entwistle and Ramsden both say it's time for second editions or new books to report on the ways their understanding has grown in the last several years. Chapters in collected volumes and journal articles — including a chapter in "Disciplinary Differences in Teaching and Learning," a forthcoming New Directions paperback from Jossey-Bass — report on some recent findings. But what's "old" is news to those who haven't heard it. The following offer provocative introductions to this very different way of looking at student learning.

• *The Experience of Learning*, eds. Ference Marton, Dai Hounsell, Noel Entwistle (Scottish Academic Press, 1984). The book, with a forward by Wilbert McKeachie, is a model of what multi-authored books could be. Each chapter builds on an awareness of the preceding chapters and tailors its contribution to the construction of a larger understanding of where the inquiry is headed, rather than blindly focusing on the findings of some specific research. Thus, the book demonstrates in its methodology how its authors believe deep learning happens.

• Noel Entwistle, *Styles of Learning and Teaching: An Integrated Outline of Educational Psychology for Students, Teachers, and Lecturers*. (John Wiley & Sons, New York, 1981). While more a textbook than a narrative, Entwistle's outline really does speak to each of his named audiences. The hard data appear in tables and footnotes, but so do engrossing excerpts from forgotten classics on learning and telling narratives from student interviews. The book also contains a short self inventory to test one's approach to studying, and it is broken up with "Stop and Think" questions that invite engagement with the meaning of the text.

• Paul Ramsden, *Learning to Teach in Higher Education*. (Routledge, New York, 1992). Ramsden lays out material clearly and is not afraid to speak bluntly when needed. He seems readier than most to offer specific advice on how to go about shifting the orientation of college teaching toward actual learning. I had difficulty locating this book, and Ramsden ended up e-mailing me chapters. It is available via Routledge's online ordering service at **http://www.thompson.com/ routledge.htm**

Using Structured Group Work to Promote Deep Learning
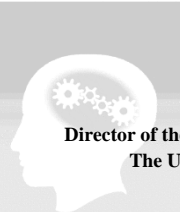
Dr. Barbara J. Millis
Director of the Teaching and Learning Center
The University of Texas at San Antonio

Overall Goals

Participants will:
- Become familiar with some key research related to teaching and learning;
- Understand how cooperative learning—when carefully structured and monitored—supports the research on teaching and learning, including deep learning;
- Reflect on the nature of their own approaches to teaching and learning;
- Enjoy interacting with like-minded colleagues.

Agenda

- **A Second (Deeper) Look at the Second Key Learning Principle**
- **Critical Writing Incident**
- **Snowball Discussion:** Looking at Applications
- Deep Learning with Two Sequenced Examples and one Activity:
  - Combining a Graphic Organizer with a Jigsaw
  - **Pro-Con-Caveat Grid**: Focusing on problem-solving in a learning-centered classroom
  - Combining a Graphic Organizer (Double-Entry Journal) with Pair work
- Quiz Options
- **Visible Quiz:** A Review to Determine Learning **[If Time Permits]**
- Conclusion

Learning Principle #2

To develop competence in an area of inquiry, students must:
(a) have a deep foundation of factual knowledge;
(b) understand facts and ideas in the context of a conceptual framework;
(c) organize knowledge in ways that facilitate retrieval and application.

Critical Incident Writing Exercise

Think of a learning experience in which you were involved where everything "clicked," a time when you felt empowered as a learner. <u>Or</u>, think of a learning experience where there was a "disconnect," a time when you felt helpless or frustrated as a learner.

                              --after Brookfield, 1990

Individual Reflection/Writing

- Briefly describe the successful or the unsuccessful learning experience.
- Why was it satisfying or dissatisfying to you?
- What contributed to your success as a learner or your failure to learn?

Pairing

- Turn to someone sitting near you and discuss your two learning experiences.
- Working together, try to derive at least one learning principle from each experience.
  - (e.g.., "Helping students believe they will succeed motivates them to learn"; "Neophyte learners need to rehearse complex procedures under low risk conditions"; "Old misconceptions can get in the way of new learning.")

Think-(Write)-Pair-Share
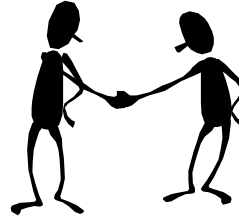
The National Teaching & Learning FORUM

Rhem, James. (1995). Deep/Surface Approaches to Learning: An Introduction. The National Teaching and Learning Forum, (5) 1, pp. 1-4.

http://www.ntlf.com/html/pi/9512/article2.htm

Key Elements that Foster a Deep Approach to Learning
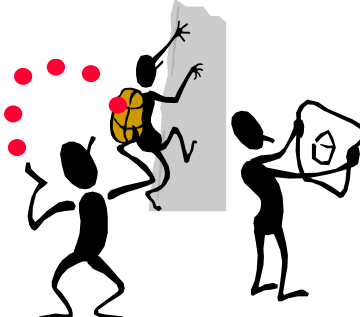
- Motivational Context: Students' motivation is intrinsic, and they experience a need to know something.
- Active Learning: Students are actively involved, rather than passive.
- Interaction with Others: There are opportunities for exploratory talk.
- A Well-Structured Knowledge Base: Content is taught in integrated wholes and related to other knowledge, rather than presented in small separate pieces. —Oxford Center for Staff Development

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Motivational Context

We learn best what we feel we need to know. Intrinsic motivation remains inextricably bound to some level of choice and control.

Active Learning:
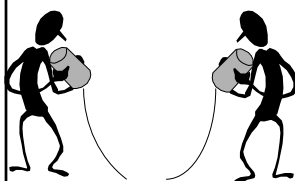
Deep learning and "doing" travel together. Doing in itself isn't enough.

When we involve students in activities that lead them to discuss, question, clarify, and write about course content, we not only foster better retention of subject matter but help expand students' thinking abilities as well.

—Chet Meyers & Thomas B. Jones. (1993). Promoting Active Learning: Strategies for the College Classroom.
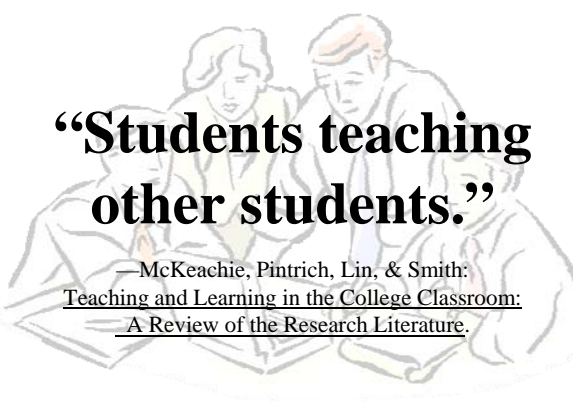
Interaction with Others:
"The teacher is not the only source of instruction or inspiration."

--Noel Entwistle

The best answer to the question, "What is the most effective method of teaching?" is that it depends on the goal, the student, the content, and the teacher. But the next best answer is . . .

"Students teaching other students."

—McKeachie, Pintrich, Lin, & Smith: Teaching and Learning in the College Classroom: A Review of the Research Literature.

A Well-Structured Knowledge Base

This doesn't just mean presenting new material in an organized way. . . . Deep approaches, learning for understanding, are integrative processes. The more fully new concepts can be connected with students' prior experience and existing knowledge, the more likely it is they will be impatient with inert facts and eager to achieve their own syntheses.

Snow Ball Discussion

- The teacher poses an open-ended question.
- Working together, two students generate as many responses as possible.
- Joining another pair, the foursome (quad) combines the list and generates other ideas.
- The quartets can combine again to form octets.

What are some active learning/cooperative learning approaches that might lead students to deeper learning?

Both Critical Thinking and Deeper Learning will occur when you:

Assign homework that gets students into the knowledge base (usually through a written assignment) in a motivating way and then reinforce the material through in-class activities with student-student active interactions (small group learning). Students are challenged individually by problems or questions, but supported in groups where they collaborate, stretch their thinking metacognitively, and face different viewpoints.

Graphic Organizer

A diagram to organize information in a visual format that suggests relationships.

"Helping students to organize their knowledge is as important as the knowledge itself, since knowledge organization is likely to affect students' intellectual performance."
—Bransford, Brown, & Cocking, Eds. How People Learn: Brain, Mind, Experience, and School.

http://curry.edschool.virginia.edu/go/edis771/notes/graphicorganizers/graphic/

Three Sequenced Activities to Promote Deep Learning

1. Homework using a graphic organizer processed through an in-class jigsaw
2. Homework Pass using a Pro-Con-Caveat Grid graphic organizer to focus discussion
3. Homework using a graphic organizer (a double entry journal) processed in class through pair work.

Evidence		Evidence
Trait	Character	**Trait**
Evidence		Evidence
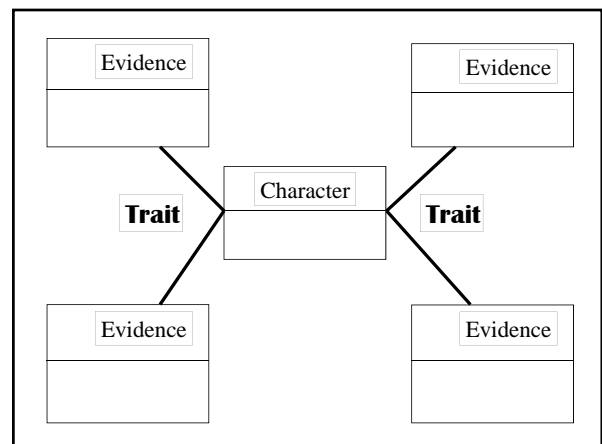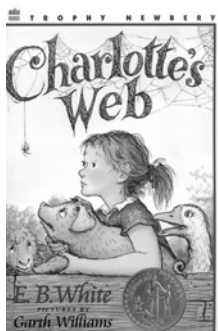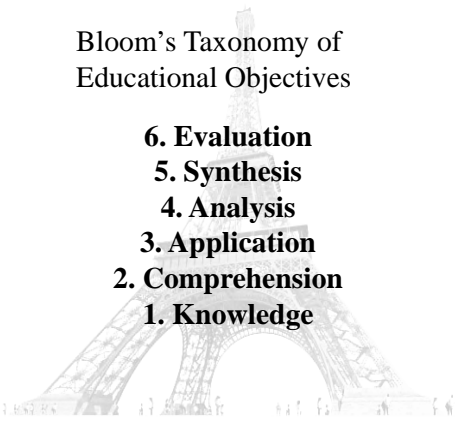
Four Characters

Charlotte
Wilbur
Fern
Templeton

Four Characters

Antigone
Ismene
Creon
Haemon

Bloom's Taxonomy of Educational Objectives

6. Evaluation
5. Synthesis
4. Analysis
3. Application
2. Comprehension
1. Knowledge

Three-Part Jigsaw: Organic Molecules that are Polymers of Carbon

- Carbohydrates
- Lipids
- Proteins

An Accounting Jigsaw: Four methods of depreciation

- Straight-line
- Units-of-production
- Sum-of-the year's-digits
- Double declining balance

Jigsaw Applications

Psychology: Underpinnings of Childhood Moral Development
- Cognitive
- Social
- Emotional
- Biological

Botany: Major Plant Groups
- Nonvascular land plants
- Seedless vascular plants
- Vascular plants with "naked seeds" (gymnosperms)
- Vascular plants with flowers and protected seeds (angiosperms)

Pro-Con-Caveat Grid

Proposition: Instructors should adopt group activities (pair-work, group work) in courses, even with large classes and students at a distance.

Pros	Cons	Caveats

Critical Review of Other Teams' Work

- Pass your Pro-Con-Caveat Grid to another team
- In your team, read the responses on the paper you receive.
- Do you agree or disagree with the pros and cons? Why or why not? Did any entries surprise or puzzle you?
- Are the responses similar to the pros, cons, caveats you wrote as a team?

Double Entry Journal (condensed)

Critical Points	Response
"Learning Styles" have been over-emphasized in the research literature.	I would agree! I have never been comfortable with so many different typologies. I have taken courses in the Myers-Briggs instrument, 4-MAT, etc., and I have never understood the distinctions and values. Other than the truism that we should vary our teaching methods, the learning styles information has been of little practical value for me as a faculty developer and as a teacher.
Researchers examined a key question, "What does it take to be good at learning?"	A good question!
Metacognition--thinking about one's thinking--appears to lie at the heart of learning, and a predisposition toward it appears to be related to the learning environment rather than to learning styles.	No comment . . . . I'm eager to read further.
There are four general social orientations: academic, vocational, personal, and social.	Wow! As the author says, faculty resist such vocabulary. I resist more lists! How can "social" be part of the definition and part of the "stem"?

"Learning is defined as stabilizing, through repeated use, certain appropriate and desirable synapses in the brain" p. 5

—Leamnson, R. (2000). *Thinking about Teaching and Learning: Developing Habits of Learning with First Year College and University Students*. **Sterling, VA: Stylus Press.**

Sequencing is important in other ways, too. Wiggins and McTighe, for example, use the term "the spiral curriculum." Others speak of "scaffolding."

What are some other reasons to sequence learning? What are some intentional ways to do this?

Wiggins, G. & McTighe, J. 1998. Understanding by Design. Alexandra, VA: Association for Supervision and Curriculum Development.

Helping Students Make Connections

The importance of previewing Materials
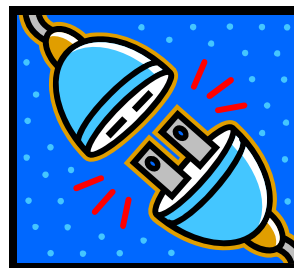
Time for a Story

If the balloon popped, the sound wouldn't be able to carry, since everything would be too far away from the correct floor. A closed window would also prevent the sound from carrying, since most buildings tend to be well insulated. Since the whole operation depends on a steady flow of electricity, a break in the middle of the wire would also cause problems. Of course, the fellow could shout, but the human voice is not loud enough to carry that far. An additional problem is that a string could break on the instrument. Then there could be no accompaniment to the message. It is clear that the best situation would involve less distance. Then there would be fewer potential problems. With face to face contact, the less number of things could go wrong.

•From Bransford & Johnson (1973)

Schemas

- Cognitive frameworks for meaningful organization of various interrelated concepts, based on previous experiences
- Schemas aid memory because they:
  – Help us understand incoming information
  – Help us "reconstruct" information during recall.

Teaching/Learning Implications

- Students' memories benefit from linking new information to things they already know.
- To be maximally effective, the context/schemas need to be activated BEFORE students receive ambiguous information.

Stressed Out About The Test?

Get Your Students to Relax with Kinder, Gentler Assessment Practices

"The key to getting students to do the necessary work and reading before class seems to lie in the right kind of in-class activities"
(p. 167)

Fink, L. D. *Creating significant learning experiences: An integrated approach to course design.* San Francisco: Jossey-Bass.

Use Quizzes for Assessment and to Promote Deep Learning

- Three unique ways:
  - Scratch-off Quizzes
  - Clickers
  - Visible Quizzes

  (Ways that students find less intimidating than traditional individual quizzes.
  Group quizzes are a powerful way to promote learning)

Scratch-off Quiz

www.epsteineducation.com
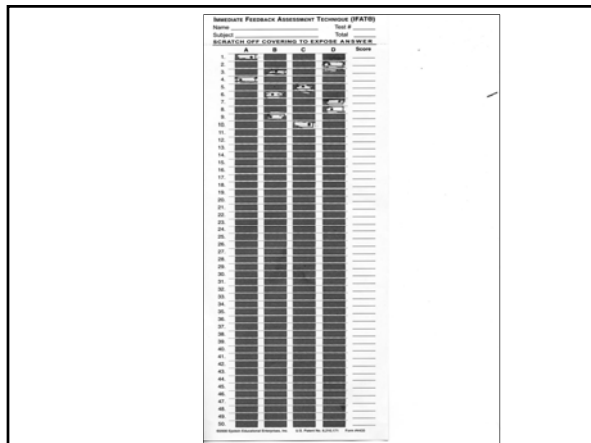
"Clicker" Technology

- The University of Nevada, Reno, campus standard, for example, is made by a company called GTCO CalComp and the system name is called Interwrite PRS-RF. Here is a link to the system:

http://www.gtcocalcomp.com/interwriteprsrf.htm

The Visible Quiz
--Dr. Connie Staley, *Fifty Ways to leave your Lectern*
[Time Permitting]
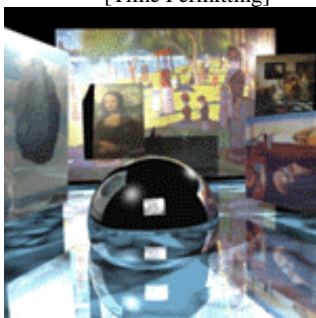
Knowing and learning are communal acts. They require a continual cycle of discussion, disagreement, and consensus over what has been and what it all means.

--Parker Palmer

Some Final Advice about Active Learning Activities and Group Work

The End!

Happy Teaching!

- 14 Ideas in the Passage

- No picture: 3.6

- Picture Before: 8.0

- Picture After: 3.6
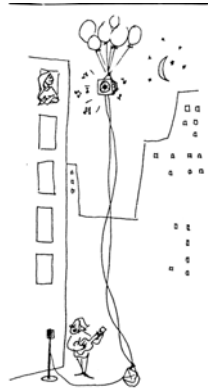
Name: Barbara J. Millis
Article: "Deep/Surface Approaches to Learning: An Introduction"
Double Entry Journal

Critical Points	Response
"Learning Styles" have been over-emphasized in the research literature.	I would agree! I have never been comfortable with so many different typologies. I have taken courses in the Myers-Briggs instrument, 4-MAT, etc., and I have never understood the distinctions and values. Other than the truism that we should vary our teaching methods, the learning styles information has been of little practical value for me as a faculty developer and as a teacher.
Many students don't get the point of what they are reading because they aren't looking for it. '	As a composition/literature teacher, this fact is no revelation to me. I am concerned now in my Eng 211 class that students truly learn to apply literary concepts and that they learn to explicate a piece of literature.
Students often adopt a surface approach to reading by seeking facts they will be tested on, not the underlying meaning.	Issues of intrinsic versus extrinsic motivation have always concerned me. I found the adult military students I taught overseas to be far more motivated--on the whole--than the cadets I have observed or taught so far. I can understand why this is the case, but it is always troubling to a teacher when students do not share her passion for the subject matter. I use IP points to motivate cadets to prepare for my classes, tying them in with structured pre-assignments.
Researchers examined a key question, "What does it take to be good at learning?"	A good question!
Metacognition--thinking about one's thinking--appears to lie at the heart of learning, and a predisposition toward it appears to be related to the learning environment rather than to learning styles.	No comment . . . . I'm eager to read further.
Researchers looking at the question above have found consistent patterns that suggest that context and content will foster or	I was struck by the contrast between the humanities fostering a deep approach and the sciences emphasizing a superficial

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<u>Double Entry Journal</u>

discourage metacognitive approaches to learning.	approach. This does not necessarily have to be the case.
The student's perceptions of the required task and their intended approaches (how they will "process the task") are intimately linked.	This makes sense to me . . .
Students learn in two broad ways: (1) Some grasp the big picture and then alter their perceptions as they acquire/discover new details [comprehension learning]; (2) others amass details and form the picture as they go along [operations learning]. Both approaches are necessary.	I'm not certain I understand this. Doesn't this counter the hypothesis that learning styles have been over-emphasized? Wouldn't one's level of understanding depend again on the context and the content. I can dip into an e e cummings poem quite comfortably based on prior learning [comprehension learning], but listening to a lecture on electrical circuits would cause me to build any comprehension slowly, based on analogies to water levels or a rat in a maze. (I actually did learn a little bit about this--I think--observing four DFEE courses!)
There are four general social orientations: academic, vocational, personal, and social.	Wow! As the author says, faculty resist such vocabulary. I resist more lists! How can "social" be part of the definition and part of the "stem"?
The simple dualism--"deep surface"--represents a highly complex view of actual learning.	I'm still not convinced!
In practical terms, this theory boils down to: "Teach toward understanding, not grades."	I am motivated to read the side bar, but not necessarily to include it in this journal entry because of time constraints. But, I want answers. How can I de-emphasize grades!? As I indicated above, I find that I need to assign IP points to get cadets to do the work, at least the underclassmen I teach now. [By the way, I am VERY interested in how Lt Col Aretz's students approach these homework assignments. Will they do them with no IP points!?]

Name: Barbara J. Millis
Article: "Deep/Surface Approaches to Learning: An Introduction"
<u>**Double Entry Journal**</u>

A "TEACHER'S DOZEN"

Fourteen General, Research-Based
Principles for Improving Higher Learning
in Our Classrooms

by Thomas Anthony Angelo

How much trust would you place in an engineer who admitted to having no knowledge of thermodynamics or other basic principles of physics, and who thought, in fact, that those physical laws didn't apply to his work? How much confidence would you have in a physician with no understanding of how bacteria and viruses cause infection, one who believed that biochemistry was irrelevant to her practice? If by some terrible mistake you were arrested and put on trial, would you hire a lawyer who thought that keeping up with the research on jury selection, effective defense strategies, and sentencing patterns was a waste of time?

These questions are obviously rhetorical, because we all expect -- or at least hope -- that professionals will be knowledgeable and keep current in the research that informs their practice. But, as college teachers, do we expect as much of ourselves?

Unless you're in a field such as cognitive science or educational psychology, chances are slim that your graduate education included any survey of the research on how humans learn. And even within cognitive science and educational psychology doctoral programs, future professors rarely study the research on adolescent and adult learning. As faculty, we tend to assume that knowing a great deal about our specific discipline -- say, British literature, biology, business, or Byzantine church history -- is sufficient preparation for teaching. Unfortunately, as most department chairs and all faculty who have children in college soon learn, that is a faulty assumption. Mastery of one's discipline may be *necessary* for effective college teaching, but it surely isn't *sufficient*

Three Assumptions

Before going any further, let me lay out the three main assumptions that undergird this article. The first is that to most effectively and efficiently promote earning, faculty need to know something about how our students --and indeed how we ourselves -- learn. The second assumption is that there really are some general, research-based principles that faculty can apply to improve teaching and learning in their classrooms. And the third is that college teaching is so complex and varied that faculty members themselves will have to figure out whether and how these general principles apply to their particular disciplines, courses, and students. The discussion that follows rests on these three assumptions like a stool on three legs: If they're sturdy, then what follows will hold up.

While there isn't space here to adequately test these three "legs," a few comments on them might be helpful. First, I assume it's important for faculty to know something about how humans learn because teaching that ignores this knowledge runs the risk of being inefficient, ineffective, and sometimes even counterproductive. The time, energy, and aspirations that we and our students invest in coursework are simply too valuable to spend carelessly.

Second, while few savvy faculty would argue that we know *nothing* useful about learning, many still protest that we don't yet know *enough* to inform teaching practice. It is true that there's still much to discover, but at the same time we do collectively know a great deal about how people learn, far more than we use. Solid research by cognitive scientists, psychologists, ethnographers, and other researchers offer much more direction to College teachers of the 1990s than was available even a decade ago. To argue that we shouldn't use what we know in teaching because our knowledge is incomplete is like arguing that sailors shouldn't use available knowledge about weather and currents in navigation because that knowledge is incomplete. Only by using what we already know can we learn more.

So, what exactly do we know about learning that might be useful to college teachers? My response is the "teacher's dozen" referred to in the title. It's my own list of fourteen principles of effective higher learning that are well supported by research. My "teacher's dozen" isn't meant to be definitive or exhaustive. It's simply one college teacher's current list of solid principles to teach by.

Why fourteen? The best known and most discussed list is Chickering and Gamson's "Seven Principles for Good Practice in Undergraduate Education." Their "Seven Principles" remain the standard, and most of those research-based guidelines can be found in my "teacher's dozen." But in making up my list, I found there were also other, more specific principles I couldn't teach without. Though I tried to limit myself to twelve, the teacher in me just couldn't give up that content. So, in the end, I decided that if a 'baker's dozen" is thirteen, then surely a 'teacher's dozen" could be fourteen.

Three Goals

Of course, whether such a list should include four, fourteen, or forty-four principles is open to discussion and debate. The first goal of this "teacher's dozen" is to encourage just that sort of questioning and dialogue. It's to invite faculty to think, talk and perhaps even read more about the connections between what we know from research on learning and how we practice teaching. Chickering and Gamson's "Seven Principles," or any other general guidelines based on research, will only stimulate meaningful, longlasting changes in teaching behavior if faculty make the principles personally meaningful by connecting them to their everyday teaching fives. On your campus, for example, you might begin this connecting process by compiling a list of principles from learning research that guide your own teaching and then comparing it with lists drawn up by your colleagues. At the least, comparing lists could make for stimulating lunchtime discussion or enliven a department meeting.

A second goal is to encourage faculty to use their personal "teacher's dozen" as criteria for assessing their current teaching practices. Once you know what principles you ascribe to, you can better determine how well your teaching embodies them. You can use a simple checklist of learning principles to quickly review your course syllabi, class notes, assignments, tests. Or you might watch a videotape of yourself teaching, checking your actions against your list. The videotape might reveal that, even though you're convinced active engagement is critical to learning, you're still doing most of the work in class, while your students passively observe.

A third, related goal is to encourage faculty to identify the implications of their "favorite" guiding principles and then develop practical classroom applications. If my third assumption is correct, each combination of teacher, course, and students is so unique that general principles have to be either "custom fit" or "custom built" to be useful in a particular class. The operating axiom is: Adapt, don't adopt. Therefore, the classroom implications and applications of these principles must be generated and validated by individual faculty if they are to have any value. Applying your own "teacher's dozen" might involve making changes in your teaching techniques, homework assignments, or tests. To return to the videotape example, once you've observed that your students are not actively engaged in

class, you can begin to systematically experiment with new techniques and approaches --and assess how much difference they make.

A Working Definition of Higher Learning

The broader agenda behind these three goals is to help faculty improve the quality of higher learning in their classrooms. But what does that mean? As an exercise in *active* reading and learning, I suggest you take out a pencil and a piece of paper now and write a one- or two-sentence definition of *higher learning* before you read any further. Once you've jotted down your draft definition, we can compare not notes to make sure we have similar concepts in mind.

What is higher learning? I define higher learning as an active, interactive process that results in meaningful, long-lasting changes in knowledge, understanding, behavior, dispositions, appreciation, belief, and the like. The key terms in this definition are *meaningful, long-lasting,* and *changes.* Higher learning is *meaningful,* if the learner understands and appreciates what is learned; that means that something learned by rote but not understood would not qualify. By long-lasting, I mean learning that will endure in accessible memory at least beyond the end of the term. And **changes** here means not simply the addition of knowledge but also the transformation of ways of understanding and organizing the knowledge learned.

This is a demanding definition of higher learning, and I certainly don't always fulfill it, but having an explicit definition does help me make difficult decisions about what and how to teach. Since there is always more worthy course content than time in the semester, I need criteria for making hard choices about what to leave out. Asking myself whether a given class activity, reading, or homework assignment will contribute on tribute to meaningful and lasting learning is a helpful decision rule.

A "TEACHER'S DOZEN"

Before I share my current "teacher's dozen," a final caveat is in order. Given the range of human variation, there are bound to be exceptions to nearly every generalization about learning. It's up to individual faculty members to determine which principles apply to whom, when, where, and how.

That said, for each of the fourteen principles listed below, I'll offer a very brief explanation and then suggest one or two implications for or applications to teaching and classroom assessment. These general implications and applications are meant merely as "pump-primers," to stimulate you to come up with more specific, appropriate ones.

1. Active learning is more effective than passive learning.

> *What I hear, I forget; what I see, I remember; what I do, I understand.*
> -Chinese proverb

> *Let the main object of this, our Didactic, be* as follows: *To seek and find a method by which teachers may teach less, but learners learn more.*
> -John Amos Comenius

As these quotations suggest, teachers have long known what researchers have only recently confirmed about the value of active learning: Students do learn more and better by becoming actively involved. But activity, in and of itself, doesn't result in higher learning. Active learning occurs when students invest physical and mental

energies in activities that help them make what they are learning meaningful, and when they are aware of that meaning-making. As George Stoddard put it, "We learn to do neither by thinking nor by doing; we learn to do by thinking about what we are doing."

Implications/Applications. Having students teach or explain something to others that they have just learned helps them learn it much more effectively, especially if they actively rehearse that "lesson" ahead of time and get feedback. To assess actively, ask students to paraphrase a central concept in a couple of sentences for one specific audience, and then to paraphrase the same explanation for a completely different audience. The two audiences might be parents and children, professionals and laypeople, novices and experts. Assess these directed paraphrases for both accuracy and appropriateness.

2. Learning requires focused attention, and awareness of the importance of what is to be learned.

The true art of memory is the art of attention.
                                        -Samuel Johnson

One of the most difficult tasks for novice learners in a field, whatever their age, is to figure out what to pay attention to and what to ignore. Students in introductory courses often cannot tell what is central from what is peripheral, foreground from background, superordinate from subordinate. Novices find these distinctions elusive, usually not because they lack intelligence but because they lack the experience needed to evaluate the data they encounter. If you've ever found yourself lost and alone in a busy city in a country whose language, culture, and street signs are totally unintelligible (some of you are thinking Boston; others, New York), then you can imagine how many students feel when they encounter a "foreign" discipline for the first time in college.

Implications/Applications. You can help novices by pointing out some of the major landmarks, by writing a list of the five key points in your lecture on the board before class, for example. You also can assess how well they are learning to read the "maps" that lectures or readings provide. Using a "Minute Paper" to find out what students thought were the most important points in a lecture or reading and what questions they still have can provide useful information on where they are getting lost and clues for getting back on track.

3. Learning is more effective and efficient when learners have explicit, reasonable, positive goals, and when their goals fit well with the teacher's goals.

If you don't know where you are going, you will probably end up somewhere else.
                                        -Laurence J. Peter and Raymond Hull

When learners know what their educational goals are and figure out how they can best achieve them, they usually become much more efficient and effective. Adult learners often fit this bill. When learners know how and how well their goals fit the instructor's, they tend to learn more and get better grades.

Implications/Applications. Early in the term, ask students to write down a few specific learning goals they hope to achieve through your course. Then involve them in comparing their learning goals with those of other students, and with your teaching goals. Look for and build on areas of congruence, but don't gloss over potential conflicts or disconnects. Refer back to and assess progress toward shared goals throughout the semester.

4. To be remembered, new information must be meaningfully connected to prior knowledge, and it must first be remembered in order to be learned.

Thinking means connecting things, and stops if they cannot be connected.
<div align="right">-G. K. Chesterton</div>

The more meaningful and appropriate connections students make between what they know and what they are learning, the more permanently they will anchor new information in long-term memory and the easier it will be for them to access that information when it's needed.

ImplicationslApplications. Provide many and varied examples/illustrations, descriptions/drawings, images, metaphors, and analogies. But ask students to provide them, as well, then give the students feedback on their usefulness and appropriateness. For instance, two simple ways to help students make connections, and to assess the connections they are making, are to ask them to compose a metaphor ("Learning is _____") or to complete an analogy ("Teaching is to learning as _____is to_____").

5. Unlearning what is already known is often more difficult than learning new information.

It is what we think we know already that often prevents us from learning.
<div align="right">-Claude Bernard</div>

Habits, preconceptions, and misconceptions can be formidable barriers to new learning, all the more treacherous because, like icebergs, this prior learning is usually 90 percent hidden from view. Before we can help students unlearn or correct prior learning, we need to know something about what is below the surface.

Implications/Applications. Before you present new material, find out what students already believe and know, and what they can do about it. A quick diagnostic "probe," containing a few questions, often can help you locate dangerous "icebergs." By asking a few diagnostic questions, you might also find out that the shipping lanes are clear and that your students are more experienced navigators than you had assumed. Whatever you discover, it will help you and the students find more appropriate starting points for your work.

6. Information organized in personally meaningful ways is more likely to be retained, learned, and used.

Much goes an in the mind of the learner. Students interpret. They overinterpret. They actively struggle to impose meaning and structure upon new material being presented
<div align="right">-Donald A. Norman</div>

Humans are extraordinary pattern seekers. We seek regularity and meaning constantly, and we create them when they are not apparent. Witness our penchant for seeing dragons in clouds, for example. To be most useful, the ways learners organize knowledge in a given domain need to become ever more similar to the ways experts in that field organize knowledge. This requires making what is usually implicit, explicit.

Implications/Applications. Show students a number of different, useful, and acceptable ways to organize the same information. Use prose, outlines, graphs, drawings, and models. Assess students' organizing schemas and skills by getting them to show you their "mental models" in a similar variety of ways.

7. Learners need feedback on their learning, early and often, to learn well; to become independent, they need to learn how to give themselves feedback.

Supposing is good, but finding out is better.
<div align="right">-Mark Twain</div>

Regular feedback helps learners efficiently direct their attention and energies, helps them avoid major errors and dead ends, and keeps them from learning things they later will have to unlearn at great cost. It also can serve as a motivating form of interaction between teacher and learner, and among learners. When students learn to internalize the voice of the "coach," they can begin to give themselves corrective feedback.

Implications/Applications. Don't assume that students understand, ask. Try asking them to jot down what the "muddiest point" was in a particular reading, lab, or lecture, then respond to the most common "muddy points" in your next class. Find out what students are doing with the feedback you're already giving them. Do they read and use the comments you write on papers and exams? If so, how? If not, why not? Explicitly demonstrate how you get feedback on your work and what you do with it.

8. The ways in which learners are assessed and evaluated powerfully affect the ways they study and learn.

> *Let the tutor demand an account not only of the words of his lesson, but of their meaning and substance... Let [the learner] show what he has just learned from a hundred points of view, and adapt it to as many different subjects, to see if he has rightly taken in it and made it his own.*
>
> -Michel de Montaigne

Whether faculty "teach to the test" or not, most students are going to try to "study to the test." For generations uncounted, students have annoyed their teachers with the question, "Will this be on the final?" One reason they persist is that most genuinely want to get good grades. But a second reason is that knowing what will be on the final, or on any upcoming test or quiz, helps students figure out where to focus their attention. In other words, they are looking for a roadmap. One way to improve learning, then, is to make sure our test questions require the kind of thinking and learning we wish to promote, and that students know - at least generally - what those questions will be.

Implications/Applications. Once you're sure your questions are testing what you want students to learn, give them a sample exam or a list of study questions from which the exam questions will be selected. Give students regular opportunities to practice answering similar questions and to get feedback on their answers. If students work in study groups, that corrective feedback often can come from their peers.

9. Mastering a skill or body of knowledge takes great amounts of time and effort.

> *There are some things that cannot be learned quickly, and time, which is all we have, must be paid heavily for their acquiring.*
> -Ernest Hemingway

In a study of talented young adults who had achieved high levels of mastery in a variety of fields, Benjamin Bloom and his colleagues found that none had achieved mastery in less than a dozen years, and the average time to mastery was sixteen years --at between 25 and 50 hours per week of practice and study. This means that at least 15,000 to 30,000 hours of time and intense practice were required to reach the highest levels of mastery. If we halve those figures to "guesstimate" the time needed to achieve an *acceptable* mastery level, we're still left

with about 7,000 to 15,000 hours of preparation -- the equivalent of 40 hour weeks, fifty weeks a year, for three-and-a-half to seven years.

Implications/Applications. Unplug all the TVs! Seriously, though, students need to know how long it actually takes to attain mastery in their field. Then they need to find out how much time they actually are devoting to that task. Give students a simple form on which they can log all the times they study/practice for a week and indicate how productively they used each block of time. Discussing their findings with other students in a nonjudgmental way can help them become aware of and gain control over their time use.

10. Learning to transfer, to apply previous knowledge and skills to new contexts, requires a great deal of practice.

Research on learning to transfer generally is depressing. Most *learning is* highly context-bound, and few students become skilled at applying what they've learned in one context to another similar a context. In fact, many students cannot recognize things they've already learned if the context is shifted at all. This is one of the reasons why students will point at questions that are only slightly altered versions of homework questions and protest, "We've never done problems like these before!" Those students who are being honest simply cannot see the similarities. They learned to solve problems involving giraffes, motorcycles, and Cincinnati; they never had to solve problems about wildebeest, cars, or Dayton.

I*mplications/Applications.* If you value transfer, teach transfer. Direct students' attention continually between the general and the specific. Give them many different examples of the same concepts or principles, and make sure they see where the similarities and the differences are. Challenge students to identify and then to create similar but different examples or problems.

11. High expectations encourage high achievement.

For some time now, we've known that younger students tend to achieve more by working with teachers who expect more of them. For the so-called "Pygmalion effect" to work well in college, however, the students must share the teacher's high expectations of themselves and perceive them as reasonable.

Implications/Applications. Begin by finding out what your students expect of themselves in your class, letting them know what you expect, and discussing those expectations. Begin the course with assignments that diligent students can succeed in to build confidence. Have learners interview successful former students, or invite them to class, to illustrate in flesh and blood that high expectations can be realized.

12. To be most effective, teachers need to balance levels of intellectual challenge and instructional support.

In discussing the ways in which mothers help children acquire language by constantly adjusting their speech to stay slightly ahead of the child's, Jerome Bruner writes of "scaffolding." Scaffolding is a useful metaphor for college learning, as well. The weaker or smaller the student's foundation (preparation) in the subject, the stronger and larger the instructional scaffolding (structure and support) that is required. This is one of the many reasons that teaching a first-year course requires a different approach than teaching a third-year course in the same discipline. Students in the third year generally require less structure and direction, and benefit from more autonomy and responsibility. This also helps explain why students of lower ability or much weaker preparation often benefit from and appreciate highly structured courses. They need the scaffolding.

Implications/Applications. Even when learner ability or preparation or both are weak, expectations should remain high. To reach those expectations, less prepared students will need more and more explicit instructional "scaffolding" such as tutoring, highly structured directions, and more personal contact with the instructor. Students who are better prepared or more able can be encouraged to master their learning by serving as tutors, helping to create scaffolding for others, and to take more responsibility for their own learning through independent studies and special projects.

13. Motivation to learn is alterable; it can be positively or negatively affected by the task, the environment, the teacher, and the learner.

Though we tend to talk about students as being either "motivated" or "not motivated," most of our students are very motivated to learn certain things and not at all motivated to learn others. Research suggests that you stand a good chance of increasing motivation to learn if you can positively influence your students' beliefs and expectations about one or more of the following: Students are likely to be more motivated to learn in your class if they see the value of what you're teaching; believe that learning it will help them achieve other important goals; believe that they are capable of learning it; and expect that they will succeed.

Implications/Applications. Give students lots of specific examples of the value and usefulness of what they're learning and help them make connections between short-term course goals and their own long-term goals. Use simple, anonymous surveys to gauge students' expectations, beliefs, and self-confidence levels, then respond to that information with specific examples, suggestions, and, whenever possible, realistic encouragement.

14. Interaction between teachers and learners is one of the most powerful factors in promoting learning; interaction among learners is another.

As with activity, it isn't interaction in and of itself that promotes academic learning, it's structured interaction focused on achieving meaningful, shared learning tasks. As the professional world never tires of pointing out, our students need to learn to work more effectively in teams.

Implications/Applications. Most students have to believe teachers know and care about them before they can benefit from interactions - or even interact. Learn students' names as a first step, then try to engage them in working with you to learn. Classroom Assessment and Classroom Research projects can engage students and teachers in working together to solve meaningful problems, such as finding ways to ensure that *everyone* in class has a fair chance to master the course content. If you want students to cooperate effectively with other students, first, challenge them with assignments that groups can carry out more effectively than individuals can; second, provide guidelines and guidance for group work especially for those who haven't had experience; and, third, de-emphasize competition among individuals for grades and approval. Meaningful and positive interactions require mutual trust.

Final Notes

Nothing is so useless as a general maxim.
                    -Lord Macaulay

Psychology is a science, teaching is an art, and sciences never generate arts directly out of them selves. An intermediary, inventive mind must make the application, by use of its originality.
                    -William James

I argued at the outset that mastery of an academic discipline is not sufficient for effective college teaching. But even disciplinary mastery complemented by familiarity with research on college learning is not sufficient. Truly effective teachers know their subjects, know something about the research that informs teaching, and also know how to adapt and apply relevant research findings to their own classrooms. Lord Macaulay was partially correct: Nothing is so useless as a general maxim that isn't properly applied to the particular. With James, I'm convinced that we **need** inventive, original minds to make the applications of these or any other general principles of teaching. I'm also confident we have such "intermediary, inventive" teachers in abundance among our faculty.

Note: This article was adapted from Session 56: "A Teacher's Dozen": Fourteen (General) Findings From Research That Can Inform Classroom Teaching and Assessment and Improve Learning," from AAHE's 1993 National Conference on Higher Education.

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A "Teacher's Dozen":
Fourteen General, Research-Based Principles for Improving Higher Learning in our Classrooms

Thomas Anthony Angelo

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2. Learning requires focused attention, and awareness of the importance of what is to be learned.

3. Learning is more effective and efficient when learners have explicit, reasonable, positive goals, and when their goals fit well with the teacher's goals.

4. To be remembered, new information must be meaningfully connected to prior knowledge, and it must first be remembered in order to be learned.

5. Unlearning what is already known is often more difficult than learning new information.

6. Information organized in personally meaningful ways is more likely to be retained, learned, and used.

7. Learners need feedback on their learning, early and often, to learn well; to become independent, they need to learn how to give themselves feedback.

8. The ways in which learners are assessed and evaluated powerfully affect the ways they study and learn.

9. Mastering a skill or body of knowledge takes great amounts of time and effort.

10. Learning to transfer, to apply previous knowledge and skills to new contexts, requires a great deal of practice.

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Two Critical Writing Incidents (One Positive and One Negative): Scuba Diving on Guam
by
Barbara J. Millis

A Positive Experience

Guam is a tropical paradise only 32 miles long. I taught English courses there for three years with the University of Maryland programs on military installations overseas. After the end of my first year, I began to get what the locals call, "Island Fever." I decided to do something about it. "Probably some of the best places on Guam are underwater," I concluded after hearing friends boast of their underseas adventures. Therefore, I decided to take up scuba diving.

I signed up for a two-week certification course with a recommended dive master. Charlie exuded confidence when our band of "wanne-be" divers, eight in all, huddled around him for the first lesson. "Let me show you the equipment," he said, displaying an orderly arrangement of "stuff." Soon we were slipping on diving belts, tinkering with air tanks, trying on flippers, and admiring regulators. "To begin diving," he explained, "you really need to keep in mind only a few key principles. Listen carefully: Here they are: . . . ."

To my amazement—and later delight—at the end of an hour, he announced that we were all to undertake our first dive. I could hardly believe that I was soon fully outfitted and slipping quietly into Guam's tropical waters. Suddenly I was surrounded by incredibly beautiful fish and stunning coral reefs. As I breathed in and out, as we had been instructed, I was comforted by the sight of the surface only a few feet above me. Charlie led us gracefully through an ever increasing variety of wonders. We gestured to one another, pointing out curious clown fish and colorful rock formations. When we finally surfaced, I knew that was "hooked."

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A Learning Principle: "Students will be motivated to learn when they experience success."

A Negative Experience

Guam is a tropical paradise only 32 miles long. I taught English courses there for three years with the University of Maryland programs on military installations overseas. After the end of my first year, I began to get what the locals call, "Island Fever." I decided to do something about it. "Probably some of the best places on Guam are underwater," I concluded after hearing friends boast of their underseas adventures. Therefore, I decided to take up scuba diving.

Because my husband is not a "water person," I decided to team with another Maryland instructor, a psychologist named Dave. We signed up for a two-week certification course with a recommended dive master and began our lessons. Dave was a great companion. We thoroughly enjoyed learning all about decompression charts, the dangers of stone fish, and the exotic equipment. Dave always had a cheerful word when I would feel discouraged. For example, one day when we were entering the water over a long stretch of slippery rocks, Dave smiled encouragingly as I stumbled and lurched because of the heavy tanks and the awkward flippers. "Did you know that in a recent poll psychologists were asked to describe in one phrase what keeps people mentally healthy? That phrase has relevance for us. It is 'Risk-taking.'" With that encouragement, I struggled onward and into the water. Everything went "swimmingly" in the course until we got to the unit on "buddy breathing."

As we sat in a gently swaying boat, our dive master explained: "'Buddy breathing'" is a certification requirement even though the new octopus regulators now allow two divers to use the same air supply. You'll never have to do 'buddy breathing,' but you have to experience it before I can issue your card. So, you and your dive buddy need to drop down to "x" number of feet with only one tank of air and one regulator. You need to pass the regulator back and forth while you surface slowly, remembering that if you come up too quickly you will suffer from the 'bends.'"

Dave shrugged at me when the dive master said, "Okay, let's do it one pair at a time." When our names were called, Dave and I obediently stepped over the side of the boat and plummeted down to the specified descent. I realized almost immediately that something was wrong. So did Dave. Unknown to us, the regular was upside down and neither of us could draw air. We were drowning. I watched Dave, almost in slow motion, as he slowly ascended, his face distended and his eyes popping, as I knew I must look. Repeatedly, I wrenched the regulator from my mouth, handing it to him, and he did the same as we continued to rise slowly, our lungs bursting. We had no air. At last we broke the surface, thankful to be alive.

We felt betrayed. Why, oh why, hadn't our dive master let us practice this procedure in shallow water?
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A Learning Principle: "Neophyte learners need to rehearse complex material under low-risk conditions."