Chapter Five

Effective Practices Common to All Disciplines: Common Building Materials

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Those of us who are privileged to work with students with basic skills needs know a bevy of success stories, students who came to us facing many challenges and who eventually overcame them. Think of one of those students now. Perhaps it's a student who had an advanced degree in his or her country of origin, but had to start all over in this one, and now has a well-paying job. Maybe the student is a single mother of three fleeing a battering husband who never completed high school but went on to earn her LVN (Licensed Vocational Nurse) and is now studying to be an RN (Registered Nurse). Possibly it's a student with undiagnosed learning disabilities who learned how to work with them and is now at a four-year college. Recall your first interactions with that student. Would you have been able to speed up her or his success if you had some tools to address basic frameworks for studying and learning in your particular class? In this chapter, we're excited to share some effective strategies that cut across all disciplines, ones that have the potential to accelerate the construction of the building that houses each student's particular academic dream.

One of the key findings in the research about students is that many enter our colleges without knowing how to be successful students. (Bransford, Brown & Cocking, 1999) Some arrive with a long history of academic struggle in high school. Others turn up without much education, whether in their home countries or this one. And still others come to us with learning disabilities. A common and confounding feature of California community college students is their complex lives with commitments to jobs, families and other obligations that must be balanced with schoolwork. Some have very unrealistic expectations about the amount of time they must devote to academics in order to succeed, never mind the other obligations that they shoulder. Most students are unaware of the meaning of a Carnegie unit and the number of hours outside of the class that must be committed to college work. The National Center for Public Policy and Higher Education reported that of the California community college students reporting that they work, the AVERAGE hours per week are 32 (Zumeta, W. & Frankie, D., 2007, p. viii). Factor this average work commitment in with other responsibilities and we find a very different situation from most of our experiences in college. When do today's students take the time required to think about learning and to focus on becoming a deep learner? Today, cognitive researchers are discovering that this may be the most important aspect of learning for all students. Teaching developmental learners how to be students, to assume a "learner identity," as discussed in detail in Chapter 6 of this handbook, is a job for all of us who serve this population. The strategies in this chapter, which move from student self-assessment and study preparedness to learning styles, are the weight bearing beams and two-by-fours used for building the

skeleton of any structure. Without them, everything else – sheet rock and plumbing, wiring and paint – will be askew. With them, the building will be supported and structurally sound.

A Little Background: Neuroscience and Learning Theory

> Until quite recently, understanding the mind—and the thinking and learning that the mind makes possible—has remained an elusive quest, in part because of a lack of powerful research tools. Today, the world is in the midst of an extraordinary outpouring of scientific work on the mind and brain, on the processes of thinking and learning, on the neural processes that occur during thought and learning, and on the development of competence. The revolution in the study of the mind that has occurred in the last three or four decades has important implications for education…a new theory of learning is coming into focus that leads to very different approaches to the design of curriculum, teaching, and assessment than those found in schools today. Equally important, the growth of interdisciplinary inquiries and new kinds of scientific collaborations have begun to make the path from basic research to educational practice somewhat more visible. (Bransford, Brown, & Cocking, 1999, p.3)

Isn't it amazing that for the very first time, we know what works to help students learn based upon brain science and research studies in neuroscience and learning theory? Combining information from a score of fields, educators are coming to better understand the mysteries of the learning process in order to help all students acquire knowledge quickly and in more depth. Their research into the SCIENCE of learning, its neurological and behavioral aspects, has opened new doors for student success. If you are having a skeptical moment, wondering if this isn't the same old stuff in a new guise, coated in edu-babble common among only a limited group of educators trying to make things more complicated and important than they are, we ask for your indulgence and exploration. This chapter deals primarily with cognition (knowledge) and metacognition (thinking about how one thinks or learns something). This information is based on well-founded research and is supported by the many resources noted in the references at the end of this chapter. So dive in and learn about learning. The National Research Council believes it may be one of the MOST important aspects for learning any discipline knowledge.

Two key components of learning are deep learning and self-regulated learning (SRL). The first, deep learning, relates to the organization and linking of knowledge so that it can be retrieved and used lifelong. The second SRL involves students thinking about their own learning in a way that allows them to transform and adapt their own learning processes. SRL is a necessary component for students to create and meet educational goals. It is the link or interface between personally developed learning strategies, cognitive content and application of that knowledge, skill or value into real world circumstances (Zimmerman, 2008, pp. 166-183). Perhaps the best news of all is that **deep and self-regulated learning can be taught in any class,** in context with the course work, and it will result in improved success for all students in most of their academic endeavors.

More has been written about this than we have time to discuss here, so we will only touch on key findings. For more information, explore the materials cited at the end of the chapter in Appendix 1; honestly, it is fascinating!

> In the latter part of the 20th century, study of the human mind generated considerable insight into one of the most powerful questions of science: How do people think and learn? Evidence from a variety of disciplines— cognitive psychology, developmental psychology, computer science, anthropology, linguistics, and neuroscience, in particular—has advanced our understanding of such matters as how knowledge is organized in the mind; how children develop conceptual understanding; how people acquire expertise in specific subjects and domains of work; how participation in various forms of practice and community shapes understanding; and what happens in the physical structures of the brain during the processes of learning, storing, and retrieving information. (Pelligrino, Chudowsky, & Glaser, 2003, p. 59)

A Quiz on Key Findings on Learning Research

How will all of this information about neuroscience affect your classroom and your teaching or service to students? Let's check out your own knowledge first with a true or false test based on the latest research. Mark each answer with either a T or F.

1. Students' pre-conceptions can be easily reshaped and replaced with new and correct content information.

2. The facts and knowledge in most textbooks and course materials, when memorized, translate into useful understanding and long-term learning.

3. Active learning when compared with typical passive learning, results in statistically significant learning increases.

4. Deep learning requires a deep knowledge from repetition and drilling.

5. Assessments are actually a learning tool, but provide a way to visualize that learning.

6. Students must be conscious and attentive to their own learning strategies.

7. Addressing self-regulated learning is the primary responsibility of the Academic Development and Counseling departments.

8. Learning strategies that include working in competitive learning teams, is more effective than working in non-competitive teams.

(See the answers to the quiz in Appendix 2 and the explanations within the text of the chapter)

The following information follows the major points made in the quiz. As each quiz answer is discussed, we have included references to research and innovative pedagogical techniques that you can employ in your interactions with students in order to support learning for all students in all disciplines.

Student Preconceptions and Misconceptions

(Quiz Question 1. Students' pre-conceptions can be easily reshaped and replaced with new and correct content information and long-term learning. ***False.****)*

Students come to colleges with pre-conceptions that must be engaged, or they will fail to grasp new concepts. "For the scientific understanding to replace the naïve understanding, students must reveal the latter (pre-conception) and have the opportunity to see where it falls short" (Bransford, Brown, & Cocking, 1999, p.16). This implies that faculty should reconsider interactions with students. Typically we consider our role as adding value to the student's college experience, but research has shown that students will learn new information for a test, only to revert to preconceptions shortly thereafter. In a now-famous research study at Harvard called *A Private Universe*, students and faculty were asked a simple question about the earth's seasons. In a truly inexplicable series of responses, it becomes apparent that students, graduate students and faculty have the same misconception about a rather simple scientific theory. In this assessment and analysis, the power of pre-conceptions to dislodge factual teaching is revealed. This 20-minute video will challenge your thinking about how people really learn. It is available for free at http://www.learner.org/resources/series28.html (Harvard Smithsonian Center for Astrophysics, Science Education Department, 1987).

When a student enters a counseling session, attempts to use the library, or attends a class, what preconceptions and misconceptions is he or she operating under? We now know that some of the information students need to learn, in order to succeed, will not be deeply learned. One example that affects both student services and instruction is the misconception that males perform better than females in mathematics and science. This may influence a student's academic goals and coursework. He or she may have had this concept drilled home in his/her previous educational experiences. Yet the data from meta-analyses show that males and females perform nearly equally in many measures of science and mathematics (i.e. number of degrees, scores on standardized testing, and grades) (as cited in Handelsman, Miller & Pfund, 2007, p. 599). Another misconception has to do with the amount of work associated with a Carnegie unit outside of class. Ask your students how many hours they should expect to work outside of class for each hour of class some time. Surely you know that your expectations and theirs sometimes differ. Do they realize that they must work two hours for every hour in class per week?

How can you combat misconceptions? In *Scientific Teaching* (2007), the authors suggested that brainstorming is an excellent means of active teaching and learning that allows you to uncover misconceptions (p.33). The use of Clickers or Electronic Audience Response Devices (EARDS) with carefully crafted questions is also effective means of revealing misconceptions and correcting them in a non-threatening manner. What misconceptions do students in your field have? Discuss this with your colleagues and you may find there are more misconceptions than you originally thought.

Discipline misconceptions have always affected the sciences, and many professional organizations have begun to study the source and extent of some very common misconceptions. But consider misconceptions that students have about writing. We sometimes wonder why they can take English courses every year through high school and yet arrive in our classes still unable to write. Perhaps they are operating on misconceptions. Behavioral misconceptions also contribute to student inability to succeed. Appendix 3 has a list of some of these misconceptions and websites dedicated to identifying them and informing teachers about them. Finally, please do not hesitate to consider what misconceptions may be underlying **our**

interaction with students that we have not analyzed thoroughly. Appendix 3 contains a link to misconceptions about multicultural teaching and English as Second Language (ESL) students. Can you list a few misconceptions you may have about students with basic skills needs? See Chapter 1 of this handbook (Who Are Students with Basic Skills Needs) for some common misconceptions about this student group and the truth about them.

Mastery of Content Specific Information

(Quiz Question 2: The facts and knowledge in most textbooks and course materials, when memorized, translate into useful understanding. ***False.****)*

Textbooks, exams, and many courses are organized around facts. This is also known as a content-centered course. It has been found that even when high-level concepts are covered, if the emphasis is on the facts alone, and memorization instead of understanding, it will not last long or be retrievable in the real world. Knowledge needs to be organized around **concepts** in order to be useful and transferred into real-life applications. Have you ever been surprised that students cannot add up the points in their classes and determine their own grades? The simple mathematics seems to elude them. This may be a case where fact-based knowledge is present, but the ability to know when to use it is absent when trying to solve a real problem. This is referred to as the "transferability of knowledge." We find this is very common in science students who cannot determine simple proportions or ratios but have sailed through calculus. Unfortunately, most textbooks and tests concentrate on independent facts even though they are relevant to a particular discipline. Making facts stick requires conceptualizing them or putting them in context. Mathematics instructors refer to this concept as contextualized mathematics, in other words, applying mathematics to real world situations. Chapter 9 of this handbook discusses this in more detail and Appendix 4 has a sample Earth Day Math Quiz which can serve as an example of contextualized mathematics built upon concepts.

Here are a few important aspects that contribute to transfer of learning (Bransford, Brown, & Cocking, 1999, p 235-236):

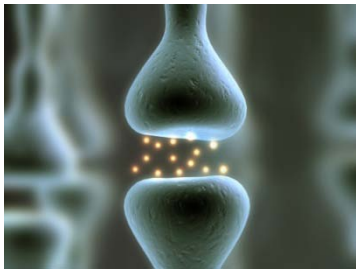
1. A certain critical mass of information must be achieved. So while facts alone are insufficient to produce learning, learning cannot be transferred without a factual foundation. However, it is important that faculty consider that knowledge is expanding like never before in history. No matter how long a course lasted, we could never cover all of the content of certain disciplines. The implication for deep learning is to carefully consider which facts are necessary, then reduce the breadth of coverage and concentrate on depth.

2. Opportunities to use the facts, reflect upon them, and apply them to problems or case studies provide practice and expertise.

3. Students need to be given opportunities to use their knowledge in flexible situations. Sometimes the answers need to not be well-known and often times there should be multiple perspectives or answers.

4. Transferring knowledge is an active process, not a passive one.

The way students study and learn creates actual chemical, physiologic and physical changes in the brain (Zull, 2003, p 112). "One of the most compelling findings is a correlation between how students study and physical changes in their brains. Specifically, the intensity and duration of experience in a complex environment corresponds with the degree of structural change to the brain" (Handelsman, Miller, & Pfund, 2007, p.5). These deep learning experiences equate to active learning.



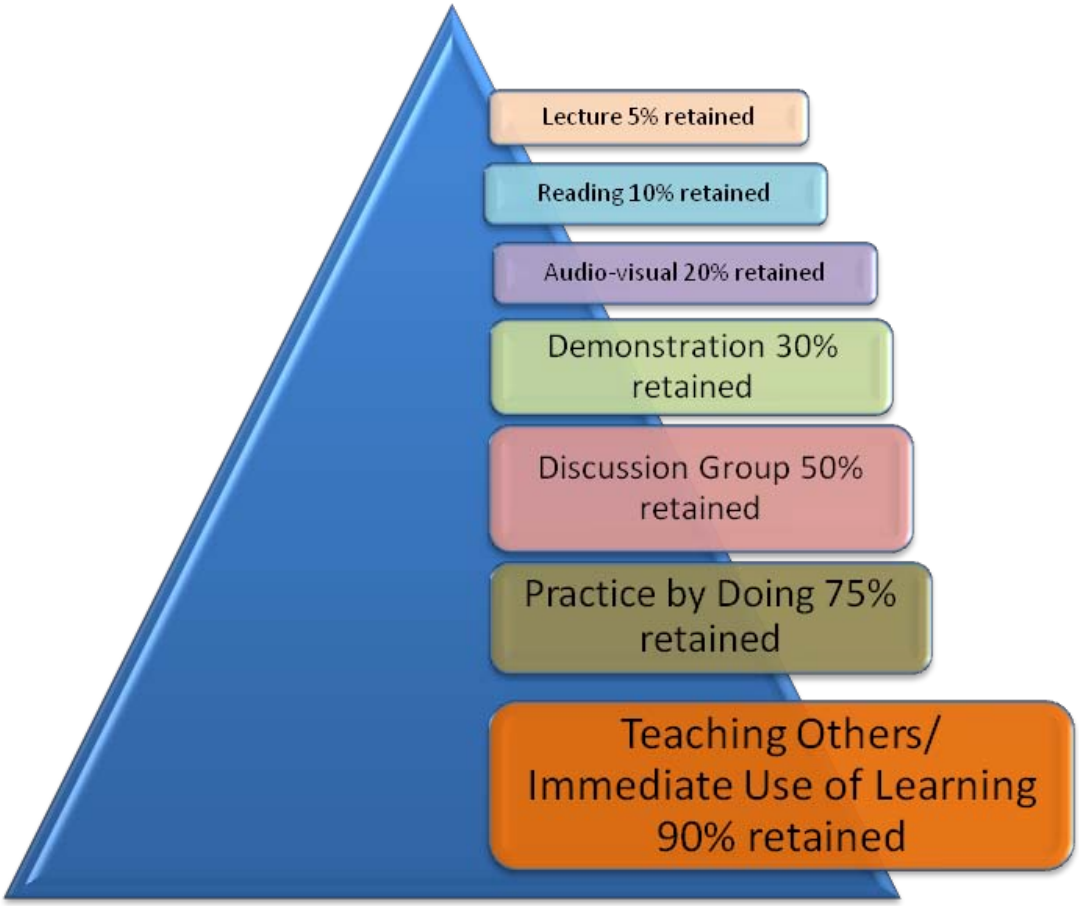
Active Learning

(Quiz Question 3. Active learning when compared with typical passive learning, results in statistically significant learning increases. ***True.****)*

"New developments in the science of learning also emphasize the importance of helping people take control of their own learning. Since understanding is viewed as so important, people must learn to recognize when they understand and when they need more information" (Bransford, Brown, & Cocking, 1999, p. 12). Students learn as they carry out their activities or answer simple formative assessments or work in groups. In *Art of Changing the Brain: Enriching the Practice of Teaching by Exploring the Biology of Learning* by Zull (2003, p. 62), he hypothesized that success toward a learning goal becomes palpable in active learning, stimulating the pleasure senses of the brain and stimulating deeper learning. He sees the active learning process as an opportunity to hypothesize, reflect and experiment with new knowledge.

Many faculty have heard that students retain information longer and learn it better when there are interactive learning activities involved. But then why do most faculty continue lecturing and valuing lecture over laboratory settings where students participate in constructing their understanding? When students are active in their own learning, they are able to organize information and retrieve it. The National Training Laboratory of Bethel, Massachusetts, produced a learning pyramid that described learning retention (Wood, 2004, ¶4). There is no data associated with this pyramid, and the percentages are too simplistic to represent research-based data, but the concepts are a good tool to gauge the pay back on the time spent in class. Each portion of the pyramid represents increasingly active and engaging learning experiences.

National Training Laboratories Learning Pyramid Relating Learning Activities to Learning Retention



Why then do we concentrate so often on the top of the pyramid? Why do we spend so much time lecturing? Where can we use more active and engaging methods?

Deep Learning

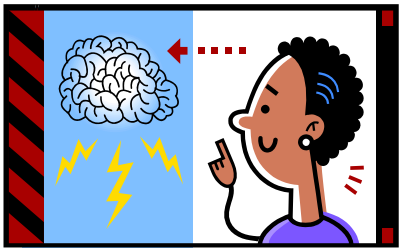
(Quiz Question 4. Deep learning requires a deep knowledge from repetition and drilling. ***False.****)*

The simple act of drilling or repetition may create memory, but unless that knowledge is linked to a scaffold of previous knowledge, it will not create analytical sources that can be retrieved in a variety of complex situations. Rather, it is more likely that it will be regurgitated on command, but lack usefulness in real world applications. "Extensive research shows that the ways students represent the information given in a mathematics or science problem or in a text that they read depends on the organization of their existing knowledge" (Pelligrino, Chudowsky, & Glaser, 2003, p.71). Students develop competence in an area when they have:

(a) A basis of deep factual knowledge,

(b) Coupled with understanding about the facts within a conceptual framework, and

c) Ultimately organized in a way that they can retrieve and appropriately relate the knowledge to a specific situation. This scaffolding of information is essential to a person being able to use knowledge (Bransford, Brown, and Cocking, 1999, p.16).



This mirrors Kolb's learning cycle where a concrete learning experience is reflected upon, and then used to form an abstract hypothesis within the learner's mind, that is then actively tested or experimented with in order to become useful learning

Dr. James Zull, a neuroscientist, hypothesized in the *Art of Changing the Brain: Enriching the Practice of Teaching by Exploring the Biology of Learning* that Kolb's learning cycle actually follows a neurological pathway through the physical anatomy of the brain (pp. 16-18). In essence, he links the whole process like this:

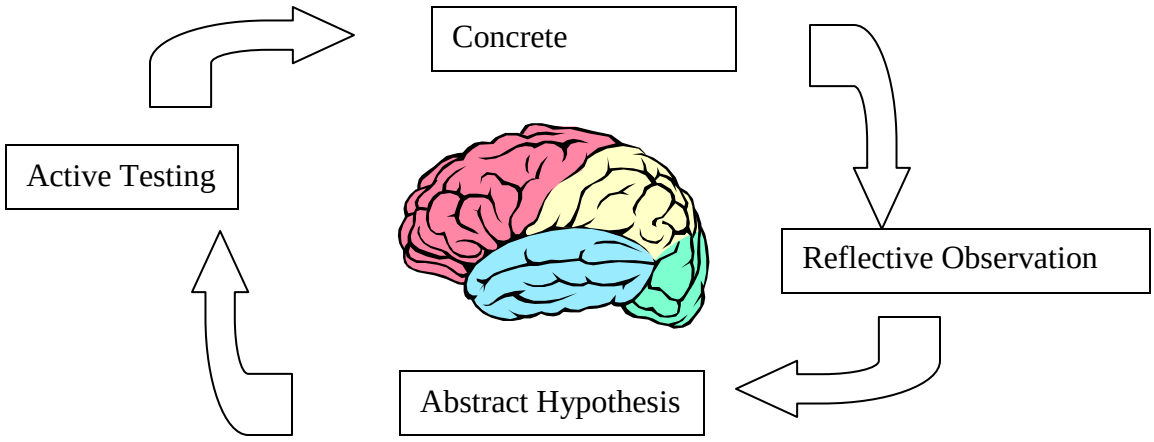
Hearing or seeing words = Kolb's concrete learning experience which occurs in the sensory cortex of the brain.

Remembering, studying, reviewing = Kolb's reflection activity which occurs in the back or posterior integrative cortex.

Generating a new idea or hypothesizing how to use the knowledge = Kolb's abstraction portion of the learning cycle, and this occurs in the anterior or frontal integrative cortex.

Trying out the knowledge or skill based on that hypothesis = Kolb's active testing, and this would involve the motor cortex of the brain.

Using technology, these physical locations can actually be mapped in the brain. So the question to faculty is: "Are you only stimulating the sensory portion of the brain in your interactions with students? Do you actively consider and engage the other activities of the brain by asking students about their hypotheses and giving them an opportunity to experiment with the new knowledge?"



Kolb's Learning Cycle Mirrors the Physical Structure of the Brain through the Brain

Assessment and Learning

(*Quiz Question 5: Assessments are actually a learning tool, but provide a way to visualize that learning.* ***True)***

An important role for assessment is timely, informative feedback to facilitate practice and acquisition of proficiency of skills and deep learning. Assessment represents the active testing that completes Kolb's learning cycle. Assessment should reveal the development of knowledge and skills to allow formative improvement, not just summative judgment, if it is to improve teaching and learning. If these terms confuse you, see Chapter 15 for definitions and examples. Assessment is the way that we determine what people have learned. Some people refer to this as making learning visible. Faculty have traditionally used assessments to assign a grade. External organizations may use assessments (usually high stake multiple choice tests) for categorizing and comparing. For more information on this topic from the research see *Knowing What Students Know: The Science and Design of Educational Assessment (2003).* Regardless of the purpose of the assessment, one thing is evident, the test material communicates to students what you, or the test giver, values. In *What You Measure Is What You Get* (1994) by John H. Hummel and William G. Huitt explained that:

> Typically, students' achievement and critical thinking skills are assessed using a forced-choice format. Unfortunately, most items used in these assessments address levels of knowing and thinking not typically associated with critical thinking. Many researchers (e.g., Carter, 1984; Gage and Berliner, 1992; Woolfolk, 1993) agree that the objective test items used at all levels of education overwhelmingly tap the lower (i.e., knowledge and comprehension) levels of the Bloom et al. (1956) taxonomy. Other researchers who developed alternative taxonomies have drawn a similar conclusion (e.g., Stiggins, Rubel & Quellmalz, 1988).
>
> These problems are crucial in that the types of assessments used in education affects how students learn and how teachers teach (Fredericksen, 1984). This conclusion is so central to teaching and assessment practices at all levels of education that in our preservice and inservice teacher education classes we use the acronym WYMIWYG to emphasize its importance. WYMIWYG specifies a concept we believe ought to be a guiding principle for all educators: What You Measure Is What You Get. If educators develop assessments aimed at higher-levels thinking skills, (a) they will be more likely to teach content at those levels, and (b) students, according to Redfield and Rousseau (1982), will master-and-perform at those levels. Students not only need to know an enormous amount of facts, concepts, and principles, they also must be able to effectively think about this knowledge in a variety of increasingly complex ways. (p.1)

This concept of viewing the content and delivery of the assessment as a teaching tool in and of itself is very compelling. If the assessment asks for rote memory, you train students to memorize and regurgitate. If the assessment relies heavily on a single learning style, you create an environment that communicates only that learning style is valued in the discipline. What are you teaching with your assessment model?

Grant Wiggins described another important aspect of assessment and learning, he calls it authentic assessment. (Wiggins, 1990) Appendix 5 has a short article by Wiggins summarizing the importance of assessing students in real-world circumstances with "worthy intellectual" challenges. (This is a short but powerful challenge to the typical assessment methods we rely on.

Metacognition

(*Quiz Questions 6and 7. Students must be conscious and attentive to their own learning strategies.* ***True.*** *Question 7. Addressing self-regulated learning is the primary responsibility of the Academic Development and Counseling departments.* ***False****)*

Students who take control of their own learning, by monitoring their own goals and progress through a metacognitive approach, achieve deep and permanent learning.

a) Students must examine how they, as individuals, think and learn.

b) Simple online self-examinations for learning styles are a good introduction.

Recent learning research has re-emphasized the significance of students taking responsibility for their own learning, because self-monitored learning prompts and improves student metacognition. Zull (2003) advocated that students' knowledge about their own learning was the most significant force in improving learning (pp. 239-240). The National Resource Council (NRC) described metacognition as one of the top three strategies that produce usable in-depth learning. The NRC emphasizes the importance of incorporating self-learning skills into the curriculum in order to actively target student metacognition and profoundly influence learning outcomes. (as cited by Pelligrino, Chudowsky & Glaser, 2003, p 4). Activities on student metacognition are most effective when used in the context of discipline classes. While Academic Development departments may address particular strategies, student metacognition is so important to success for all students in all courses or activities, it should be addressed in every venue to increase knowledge transfer (Bransford, Brown, & Cocking, 2000, p. 18–19).

In summary, metacognitive activities embedded in courses lead to:

- improved learning,
- increased ability to transfer knowledge to real life situations, and
- self-dependence necessary for establishing habits essential to lifelong learning.

In otherwords, metacognition is the important characteristic that is demonstrated in successful students.

Student Self-assessment: A Metacognitive Strategy

> Self-assessment is a method that allows -indeed forces-- students to take stock of and analyze their own learning. As such, it can be not only an evaluative tool but an educational process in its own right. (Wright, 2000, p.10)

Research describes student self-assessment as one of the most pro-active and effective techniques to improve student learning. It provides an entryway into looking at and mastering key foundational skills. The most shocking finding of all is that if students aren't aware of these skills and have not found ways to master them, they **cannot** learn discipline content. (Bransford, Brown, & Cocking, 1999, pp.18-19).

In addition, beyond thinking about their own learning, students must become SRL. SRL involves students thinking about their own learning in a way that allows them to transform and adapt their own learning processes. SRL is a proactive strategic approach to the learning tasks at hand and educational goals in the future (Zimmerman, 2008). In many cases, this ability to regulate one's own learning is visible by specific behaviors we have all identified in students.

You know from your own experience what can happen to students who lack college readiness. Often it is not a lack of a discipline specific ability that derails student success, but a general deficiency in the knowledge of how to be a student. The January-February 2008 *Academe* article, College Student Character Dysfunction, by Angela Walmsley and Jeffrey McManemy, described fundamental social deficiencies characteristic of today's students that ultimately cause them to be unsuccessful in college and the workplace (pp. 51–53). These "dysfunctions," as the authors of the article call them, are not character flaws, but simply behaviors that students haven't yet learned; it is our job to teach them. The chart below, taken from this article, identifies evidence of dysfunction and, more importantly, some strategies you can use to help them develop other behaviors.

Features of Character Dysfunction	Strategies to Improve Character Development
1. Poor boundary control 2. Lack of emotional control 3. Inability to set limits 4. "Hiding behind" technology 5. Inadequate social skills and function 6. Inability to communicate in global society 7. Excessive use of defense mechanisms ("it's not my fault")	1. Be firm and realistic about expectations for classroom behavior 2. Clearly communicate expectations with students and allow for feedback 3. Use technology appropriately 4. Be approachable and professional and set appropriate boundaries 5. Use campus referral systems and student support services 6. Exercise consistency and fairness as guiding principles 7. Be a good role model and demonstrate professional communication and interaction

In addition to these strategies, which depend on you, another way to approach the development of college readiness is to use a student self-assessment. The interactive nature of the self-assessment, and its requirement that students reflect on and judge their own behaviors, makes it a more efficacious approach than simply telling students how you expect them to behave in your class or office. Best of all, it only takes five to ten minutes to complete. You can use the self-assessment shown below on the first day of class while you are taking roll. It can set expectations beyond those in your syllabus in an interactive manner. Have the students self-assess and then take a few minutes to discuss which of these are difficult for them or important to you.

Student Success Checklist

Survival level skills

- ☐ I meet the class deadlines.
- ☐ I frequently look at the class syllabus and schedule to know what I need to do.
- ☐ I turn off my cell phone when I go to class.
- ☐ I am attentive in class.
- ☐ I listen to answers given in class by both teachers and students.
- ☐ I underline or highlight the key points in my text.
- ☐ I look up words I do not understand.
- ☐ I do the homework.
- ☐ I actively participate in class discussion.
- ☐ I ask my teacher questions.
- ☐ I know how to type and use a computer, including e-mailing with attachments.
- ☐ I know how to get access to a computer if I don't have one.
- ☐ I can say what I think.
- ☐ I don't judge people simply because they are different from me.
- ☐ I understand my learning style.
- ☐ I know my overall grade in the class.

Success Level Skills

- ☐ I listen and simultaneously take notes.
- ☐ Every time I read something or listen to lecture, I try to pick out the main ideas.
- ☐ I review my text and lecture notes to synthesize the key points.
- ☐ To study I put my notes and textbook information in a form that will help me review and learn (flash cards, flowcharts, rewritten notes, mind maps, charts, tables).
- ☐ I form study groups with other students that meet outside of class.
- ☐ I try to explain information, in my own words, I learn in class to my friends and family.
- ☐ I recognize that college level writing exceeds the kind of writing I use for text messaging and e-mail and my class work.
- ☐ I know how to use and cite research appropriately.
- ☐ I can say what I think and why I think that way.
- ☐ I know that in college many people see things different from me because of their culture, and I try not to let people make judgments based on differences.
- ☐ I know my learning style and effective ways of studying specific to that style.

Advanced Scholarly Behavior

- ☐ I don't expect the teacher to have all the answers, so I seek answers myself.
- ☐ I review my text, summarize lecture, and synthesize outside materials relevant to the course.
- ☐ I understand what plagiarism is and I do not take credit for thoughts that aren't mine, material I didn't create, or work I didn't do.

- ☐ I can state my own opinion, compare it with others' opinions and explain the differences between them.
- ☐ I understand and appreciate opinion and perspectives from cultures unlike mine.
- ☐ I understand my learning style; know how to study effectively for that style and to continue learning when teaching styles don't match my preferred learning style.

You can turn this survey into an assessment measure of student learning outcomes by giving it on the first and last day of class. Use it as a pre- and post-test and note the differences. Have your students grown or changed over the course of the semester? Close the loop by planning how you might do anything differently to be more effective and improve teaching and learning. If any of the terms used in the description above are unclear to you, see Chapter 18 of this handbook (Assessment Basics for detailed definitions and explanations).

More Metacognitive Techniques for College Readiness

Some institutions have created very useful brochures to help guide students through the process of becoming scholars. In Appendix 6, a brochure from Sierra College clearly communicates the difference between college and high school expectations. This brochure has received excellent responses from students and faculty alike. The College Readiness brochure was an idea brought back to Sierra by a faculty member who attended the national College Reading and Learning Association (CRLA) Conference. Originally designed and created by the Minnesota Association for Developmental Education, the brochure has been adapted (through permission) for the specific use of Sierra College faculty and staff.

Sierra uses the brochure in several ways. First, it is heavily used by outreach specialists as a way of helping high school students see the dramatic differences between high school and college study. In hopes of giving high school students a "leg-up" on college preparation, outreach specialists use the brochure during high school presentations and college nights. The brochure is often included in information packets that are shared with high school students because it serves as a springboard for more in-depth discussion about differences that students will see at the college level, the great range of support services available to help students, and the overall personal responsibility that is involved in making the transition to college-level study.

Outreach specialists assess the use of this brochure by giving a short pre-quiz about the differences between high school and college study before their presentation of the brochure, and then give it again at the end. They then compare the results to see if the students have gained any increased knowledge.

Second, the brochure is also put into packets and shared with parents during Parent Information Nights. Discussing the brochure helps parents gain perspective on how they might help their sons and daughters smoothly transition into college. It is also a tremendous help to parents who have not attended college themselves and thus have no framework from which to discuss differences between high school and college.

Third, the brochure has served as a curriculum stimulus to some instructors who use the brochure indirectly in their developmental classrooms by teaching a number of the skills that are contained in the "success in college" column. Strategies such as test taking, memory skills, and text reading are incorporated into their classes because of the excellent way this information is outlined in the brochure.

Last but not least, instructors also use the brochure directly in their courses. Computer Information Systems (CIS) 30, Fundamental Computer Concepts and Applications, is a course included in the developmental education program at Sierra College. Melissa Prinzing, an instructor of this course, has created the following activity for her students based upon the College Readiness brochure.

E-mail about College Success

In this activity, you will read the "College Readiness" brochure and send an e-mail response to your instructor and classmates.

1. Start Internet Explorer. Locate your e-mail website and log into your e-mail account.
2. Start a new e-mail message. Address the message to your instructor and to at least 3 classmates. (Instructor's e-mail address in syllabus.)
3. CC: yourself. You will be printing the copy you receive and turning it in.
4. In the message Subject, type: Lesson #3 College Success *your first & last name*. Substitute your own first and last name.
5. In the Body of the message type **Lesson #3, Prinzing, CIS30, *your name*, *class day and time*…** Substitute your own first and last name and your class day and time.
6. Continuing in the message body, press the Enter key to leave a blank line and then type the title: College Success again press enter to leave a blank line or two.
7. Read the brochure provided by your instructor about understanding the difference between high school and college.
8. In your e-mail type a paragraph about the parts you found most surprising or least true in your own experience.
9. Leave a blank line and then type a second paragraph about parts that most ring true to you - that most closely match your experience or expectations.
10. Finally type a third paragraph. After reading this article, what changes will you make in your expectations or behaviors this semester in order to increase your success?
11. Check spelling and proofread for neatness, spacing, proper punctuation and capitalization.
12. Keep a copy of your message in your sent folder. Send the message. Watch for your CC'd copy to come to your inbox.
13. Print your copy of the message.

Dr. Prinzing assesses the effectiveness of this strategy by carefully checking the assignment for completeness and accuracy on each point in the directions, including subject line, addresses, inclusion of three paragraphs on topic, spelling and proofreading for neatness, spacing, proper punctuation, and capitalization. This type of course-

embedded assessment (see Chapter 15 of this handbook for more details about this) is used for the students' own grade but also provides her with valuable information about teaching and learning and the students' needs.

Please feel free to re-type the brochure for your own school's use and make any changes you desire. On your final copy, we ask only that you provide attribution to the Minnesota Association for Developmental Education, whose generosity in presenting the brochure allows us to share this material with you. Additional examples of self-assessment materials are available in Appendix 7.

Student Learning Styles

In *Knowing What Students Know: The Science and Design of Educational Assessment*, the National Research Academy explained that "Metacognition is crucial to effective thinking and problem solving and is one of the hallmarks of expertise in specific areas of knowledge and skill. One way to develop healthy thinking about one's own thinking is to consider learning styles" (Pelligrino, J.W., Chudowsky, N, & Glaser, R, 2001, p. 4).

Most people recognize that individuals have various learning styles. Research has demonstrated that students who think about how they learn best and about what learning strategies are suited to their style perform far better. This is beneficial regardless of student majors or academic sophistication.

The existence of diverse learning styles is not in question, however, the definition of the styles and the terminology varies. It is the act of considering how students best learn that makes examination of the various research documents and resources available on learning styles a useful exercise. The key thing is for students to recognize that they learn more easily using certain learning channels. In fact, knowledge of learning styles can, at times, be the key that unlocks learning potential in our students.

There are numerous ways of determining our students' learning styles, but one of the most common is through the use of learning style inventories. The VARK and the Diablo Valley College Learning Styles Survey are two of the most frequently used.

There are several free and readily accessible sites:

VARK - http://www.vark-learn.com/english/index.asp

Solomon and Felder Learning Style Index
http://www.engr.ncsu.edu/learningstyles/ilsweb.html

Marsha Conner's Learning Style Assessment
http://agelesslearner.com/assess/learningstyle.html

Mencke and Hartman – Learning Style Assessment
http://www.ulc.arizona.edu/learn_styl_ass.html

Brookhaven Learning Styles Assessment Links to several varieties of learning assessments
http://www.brookhavencollege.edu/learningstyle/learning_style_assessments.htm

Learning style inventories can be used in a variety of different ways and with a variety of different courses and support services. In the two methods shared on the next page from Sierra College, both learning center and learning disability specialists use learning style inventories to help increase the success rate of their students.

Learning Styles and Tutoring

During her tutor training class, Janet Riswold, Learning Center Specialist, has student tutors take both the VARK http://www.vark-learn.com/english/index.asp and the DVC Learning Styles Survey http://www.metamath.com/lsweb/dvclearn.html. She asks tutors to compare and contrast the two and to consider which one they would use with a tutee. Next, the student-tutors bring their test results and the associated help sheets from VARK to class. Janet then divides the class into groups based on their VARK results. They meet and discuss the following questions: 1) Which strategies (if any) given on the help sheet have you successfully used, as a student, in the past? 2) Are there any strategies that have worked for you that are NOT listed on the help sheet? Each group then presents their findings to the rest of the class.

What is interesting is that each groups' presentation reflects their own learning preference. For example, in a recent class, the Read/Write group posted a written list with many written details, while the Visual group used graphics rather than a list, and the Kinesthetic group actively drew on the white board during the presentation. The class responded to this activity with enthusiasm when they saw how differently each group responded to the same instructions.

Most of the student tutors indicate that they intend to discuss learning preferences with their tutees and will have the tutees take one of the inventories when appropriate. After this exercise, they also indicate that they feel well-equipped to use a variety of learning strategies in their tutoring sessions.

Learning Styles and Learning Disabilities

Martine Shelley, Learning Disabilities Specialist, explains that as part of the Learning Disabilities assessment process, students complete an online learning styles survey. They are given a handout with very explicit instructions to link to the following website: www.metamath.com/lsweb/dvclearn.htm (Diablo Valley College). This website has a short learning style survey and gives specific strategies for a student's own learning style. Sometimes, as a backup, students are directed to the VARK survey (www.vark-learn.com/english/index.asp).

During students' final results appointments Learning Disabilities Specialists go over students' learning styles, integrating their learning style with the results of their psycho-educational testing, encouraging the use of accommodations that work best for their specific style. For example, it would be very important for auditory learners to work with tutors so they are able to talk and hear things explained in different ways. Auditory learners also benefit from peer study groups,

instructor's office hours, and text to speech aids, like Kursweil or textbooks on CD, e-text. Also they may benefit from using a speech-to-text program like Dragon Naturally Speaking.

Many students with learning disabilities (as well as developmental education students) are kinesthetic learners. They have to find ways of integrating movement and activity into their studying. For example, some kinesthetic learners benefit from studying outside and walking as they read. This activates movement sensors in their brain. As they walk outside, they should pay attention to what they feel or where they are as they study each fact. During exams, they can recall where they were when they studied particular facts and what it felt like (cold, hot). This often triggers their memory to bring up the information.

Another strategy that works for kinesthetic learners is to write vocabulary or spelling words in huge letters on a white board. This activates their large muscles and access to different parts of their brain. Also, writing their words with their finger on a table helps. As they feel their finger and forearm move across the tabletop, they receive tactile feedback that helps them remember better.

When students come to me struggling with their courses, I often refer back to their learning style to recommend strategies that will help them succeed. They have to try different strategies, and some will work better than others. It is like having a bunch of keys to unlock a door; they just have to keep trying different keys until they find one that unlocks that door. I tell students that they have to become students of themselves, and to pay attention to when something is working and to keep using that strategy.

Sometimes students feel frustrated because they don't seem to be learning, or feel they cannot learn. Often, they have not received the learning experience that matches their learning style. I encourage students to try to choose instructors whose teaching style matches their learning style. Knowing about their learning style and applying that knowledge empowers students because it respects their individuality and their learning ability.

Please look at Appendix 8 for "Tailoring Assessment to Student Learning Styles," an article about the importance of considering different learning styles and the related abilities to perform on assessments, tests, etc.

Group Work to Enhance Active Learning and Multicultural Experiences

(Quiz Question 8. Learning strategies that include working in competitive learning teams, is more effective than working in non-competitive teams. ***False*****)**

One way to incorporate a variety of learning styles, allow diverse expressions and create an infrastructure requiring critical thinking and self-regulated learning is through teamwork or group work. Most employment classified ads require applicants to be team players or work well with colleagues, a great life skill. Yet, many faculty refrain from teamwork for a variety of reasons.
Can you list those reasons in the box on the next page

Reasons for not having team work in classes.

The Potential Problems with Teamwork

Some of the problems involve ethical considerations. Will the students cheat from one another? Will there be some students who do not work while others work very hard? A simple perusal of the news over the last several years reveals that professionals in all disciplines (business, journalism, politics, stem cell research, literature) see to be having a problem with either plagiarism or self concocted evidence for claims. Why should our students be any different?

Then there are questions of grading. How do you provide adequate criteria to provide grades to everyone based on clear criteria? Do you grade everyone on one project with the same grade? If you give different grades within a team, how do you document those grades? Another source of concern is the problem when team members do not get along for any number of reasons. Sometimes groups can get so dysfunctional, they appear to need a psychotherapist at times. However, life is working together, and learning to deal with social dynamics is an important part of academia where we tout collegiality!

Reasons to Look Beyond the Teamwork Problems

The very cause for potential problems makes this learning experience an essential one in higher education. And yet, we must deal up front and openly with the unacceptable problems that may occur. We must have clear standards to create precedence for our students in later teamwork situations.

Teamwork allows the use of very complex, real world driven problems and projects. Good teamwork assignments demand multiple levels of thinking and analysis. Teamwork allows the students to contextualize their learning not only within their own culture and understanding, but to expand their learning to cover the culture and understanding of their team mates.

One structural problem with teamwork is that it is often based upon the good old American value of competition. The additional motivations driven by competition result in some of the problems indicated above. In *Scientific Teaching* (2007) the authors describe the importance of cooperative versus competitive teamwork assignments. The power of learning in a team where the dynamics of the team are free to perform without intra or extra team competition is important. This is especially important in classes with multiple cultures represented. Some Asian cultures value saving face over competing, and other cultures see competition as a negative value. "In cooperative groups goals can be achieved by most or all members; in competitive groups, goals can be achieved by some members, but not all" (p.28).

Research has shown greater success in cooperative groups in the areas of "obligation to participate, diversity of contributions, subdivision of labor, understanding communication, pressure to achieve, productivity per unit time, quality of product and orderliness in the cooperative group" (Handelsman, Miller, & Pfund, 2007, p. 28). In addition, research has shown that although faculty have concerns about high achieving students being penalized when they must work with less able students, this is not true. "Rewey and her colleagues (Rewey et al. 1992) showed that cooperative learning can heighten learning among low-ability undergraduate students without diminishing the performance of high-ability students. Physicist Robert Beichner showed in a national study of physics classrooms at three universities that all students benefited from cooperative active classroom compared to traditional lecture, but high achieving students benefitted most (as cited by Handelsman, Miller, & Pfund, 2007, p. 29).

Now can you list reasons to have teamwork embedded in your class? Don't be afraid to use teamwork for real evaluation or course assessment. See Appendix 9 for a simple sign off sheet that you can use with students in teams to guarantee each student gets the grade they deserve.

Reasons for having team work in classes.

To Summarize

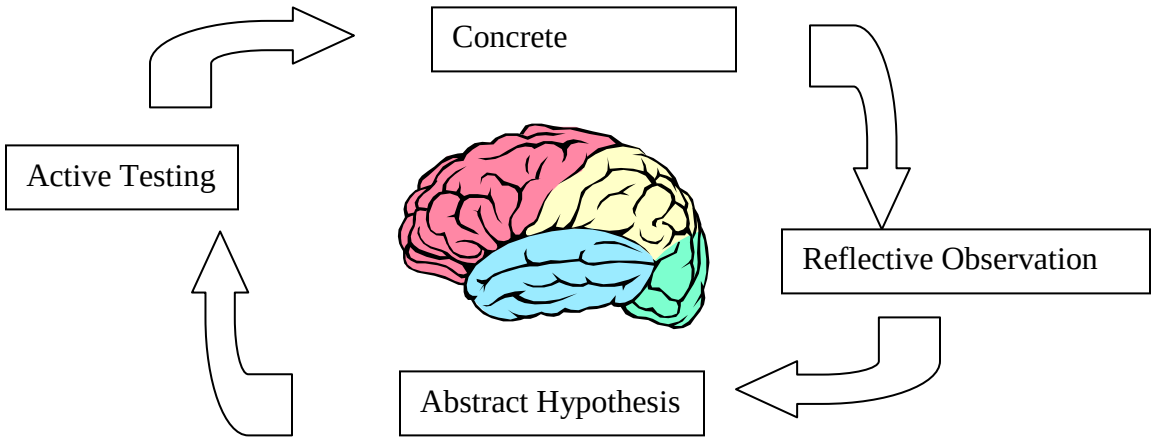
Consider the courses you are teaching. Which of the following would you like to explore more in-depth to use in your class?

- ☐ **Identification of preconceptions and misconceptions**
- ☐ **Active learning strategies**
- ☐ **Deep and mastery learning**
- ☐ **Assessment for learning**

- ☐ **Student metacognition**
- ☐ **Learning styles**
- ☐ **Group work**

You can strengthen the building that houses a student's academic dreams by applying these methods to your classroom. Use the materials in the Appendix to learn more about any of these techniques and incorporate them into your courses. If you do, research shows that students with basic skills needs will have more success. You have the potential to make a major difference in their lives just by experimenting with any of these strategies. Many faculty also report that it strengthens their classrooms and adds value to their of teaching. "And," some have whispered to us at conferences or trainings, "it makes the class more fun too."

Remember learning is a chemical process that involves an actual physical pathway through the brain. This pathway is different for each person. We know this when we observe people's brain activity as they solve problems. We have embarked on a new time period where research provides great insights into effective teaching strategies. Think about which will be most effective in your work and share it with colleagues. Employ the learning cycle as you reconstruct your interactions with students!



Kolb's Learning Cycle Mirrors the Neural Pathways through the

Appendix Chapter 5
Effective Practices Common to All Disciplines: Common Building Materials

Appendix 1: Excellent Resources on Neuroscience and Metacognition

Appendix 2: Quiz Results

Appendix 3: Misconceptions Websites

Appendix 4: Contextual Math Earth Day Quiz

Appendix 5: *The Case for Authentic Assessment* by Grant Wiggins

Appendix 6: Other Examples of Assessments that Target Student Metacognition

Appendix 7: *Tailoring Assessment to Student Learning Styles*: *A Model for Diverse Populations* by James Anderson

Appendix 8: Grading Student Group work

Appendix 9: Sierra College Brochure

Appendix 10: Resources for Chapter 5

Appendix 1
Excellent Resources on Neuroscience and Metacognition

Annenberg Media. A Private Universe, Harvard-Smithsonian Center for Astrophysics, Science Education Department, Science Media Group, Annenberg Media, http://www.learner.org/resources/series28.html

National Research Council. *How people learn: brain, mind, experience, and school.* (1999). John D. Bransford…[et al.], editors; Committee on Developments in the Science of Learning and Committee on Learning Research and Educational Practice, Commission on Behavioral and Social Sciences and Education, Washington, D.C.

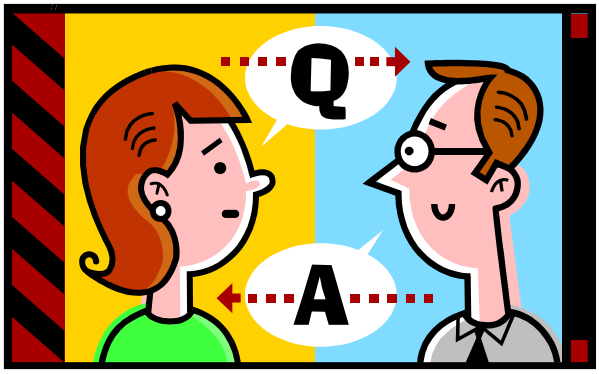
National Research Council *, Knowing What Students Know: The Science and Design of Educational Assessment* National Resource Council (NRC) 2001 National Academy of Sciences

Wright, B. D. (1999). Evaluating learning in individual courses. Retrieved June 10, 2003 from the California Assessment Institute Website. http://www.ca-assessment-inst.org/Resources/Wright2.doc

Zimmerman, B. Investigating Self-Regulation and Motivation: Historical Background, Methodological Developments, and Future Prospects. (March 2008). American Educational Research Journal (Volume 45, No. 1, pp. 166-183).

Zull, J. E. (2003). The Art of Changing the Brain: Enriching the Practice of Teaching by Exploring the Biology of Learning. Sterling, VA: Stylus.

Appendix 2
Quiz Results



Answers to the Quiz

1. False
2. False
3. True
4. False
5. True
6. True
7. False
8. False

Appendix 3
Websites Identifying Misconceptions

Botany - http://www.actionbioscience.org/education/hershey.html

Misconceptions about LEP (ESL) students -
http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/common_misconceptions.pdf

Misconceptions on Multicultural Education - http://www.acei.org/misconceptions.htm

Student Misconceptions in Math and Science -
http://eric.ed.gov/ERICWebPortal/custom/portlets/recordDetails/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED293685&ERICExtSearch_SearchType_0=no&accno=ED293685

Physics Misconceptions - http://www.physics.montana.edu/physed/misconceptions/index.html

Student Misconceptions induced by Teachers and Textbooks -
http://www.lhup.edu/~dsimanek/scenario/miscon.htm

Science – Minds of Our Own a video with Annenberg Media
http://www.learner.org/resources/series26.html

Writing - http://www.utsc.utoronto.ca/~tlsweb/TWC/writeguides/myths.htm

Appendix 4
Earth Day Quiz – Contextual Mathematics

Here's a math quiz developed by Kerin Keys and Anna Werner of City College of San Francisco
kkeys@ccsf.edu

Earth Day Quiz 2008

Directions: On the answer sheet at the bottom of the page, write the letter of the best answer for each question below. Tear off the answer sheet, complete the information requested, and turn it in at the Quiz Table, on Ram Plaza, on Earth Day - Tuesday April 22.

When you turn in your answer slip, you will be automatically entered in a raffle to WIN PRIZES!

1. The average American uses 159 gallons of water per day. The average person in half of the rest of the world uses 25 gallons per day. What percent more does the average American use?

   a. 636% b. 5.36% c. 536% d. 6.36%

2. Fill in the blank with the correct symbol: Energy used by the U.S. _____ Energy used by all developing countries combined.

   a. = b. > c. <

3. To produce each week's Sunday newspapers, approximately 500,000 trees must be cut down. Considering that a high density forest has 250 trees per acre, how many acres of forest is that per year?

   a. 26,000,000 b. 104,000 c. 2,000 d. 24,000

4. The following environmentally related job uses math every day:

   a. solar power engineer
   b. environmental attorney
   c. environmental policy analyst
   d. all of the above

5. The EPA estimates that you can save 12% on your utility bills if you use energy efficient appliances and insulate your house or apartment. If an average household pays $150 a month during half of the year (summer and winter months) and $75 a month during the other half, how much savings is that in a year?

   a. $27 b. $118 c. $162 d. $81

6. The average American generates 52 tons of garbage by the time they are age 75. Approximately how many pounds of garbage is this per day?

a. 0.002 pounds per day
b. 0.694 pounds per day
c. 2 pounds per day
d. 3.8 pounds per day

7. Recycling just 1 ton of aluminum cans rather than throwing them away conserves the equivalent of 1655 gallons of gasoline. In 2006, the US generated 3.26 millions of tons of aluminum waste and 21.2% of it was recycled. How many gallons of gasoline did that save?

a. 1,143,803,600 b. 114,380 c. 41,760 d. 11,438,036

8. Since 1960 the EPA has collected data on the generation and disposal of waste. The municipal solid waste in millions of tons are in the table below:

1960	1970	1980	1990	1995	2000	2006
88.1	121.1	151.6	205.2	214.3	238.3	251.3

What is the approximate percent increase between the years of 1960 and 2006?

a. 285% b. 85% c. 185% d. 35%

9. If the best fitting linear model for the data in the previous example is where x is the year, and y is the solid waste in millions of tons, calculate what predicted amount of solid waste - will be generated 15 years from now.

a. 311.43
b. 7122.8
c. 55.6
d. 318.84

10. Every ton of mixed paper recycled can save the energy equivalent of 185 gallons of gas. In 2006, in the US, of the 251.3 million of tons of solid waste 33.9% was mixed paper, and we recycled 51.6% of the total mixed paper waste. How many gallons of gas did we save?

a. 94,372.2
b. 94,372,181,500
c. 8,132,304,222
d. 8,132.3

11. The annual amount of waste the Red Bluff landfill in California accepts is 60,000 tons and its capacity is 2.9 million tons. Currently it has 1.5 million tons in it. At this rate, when will the landfill close?

a. 2033 b. 2013 c. 2012 d. 2031

12. Some hybrid cars average 41 miles per gallon. If in 10 years you drive one an average of 15,000 miles per year, how many gallons of gas will you use less than if you were driving a car which averages 25 miles per gallon?

a. 3659 b. 146 c. 3634 d. 2341

13. The circumference of the earth is approximately 24,900 miles at the equator. If we lay sheets of paper 11 inches long end to end, how many pieces of paper will it take to go around the earth?

a. 131,472,000 b. 143,424,000 c. 1,577,664,000 d. 191,232,000

14. Based on your answer above, if Americans use a total of 4.3 billion sheets of paper per day, approximately how many times would that circle the earth (every day!)?

    a. 5 times b. 25 times c. 30 times d. 40 times

15. I can personally protect the environment as a math student by:

    a. using both sides of notebook paper and the clean side of used printer paper
    b. using a refillable lead pencil
    c. re-using folders from one semester to the next
    d. all of the above.

Answer Slip: Complete, tear off, and turn in at Sust. Across Curric. Table, Ram Plaza, 4/22

1.___ 2.___ 3.___ 4. ___ 5.___ 6.___ 7.___ 8.___ 9.___ 10.___ 11.___ 12.___ 13.___ 14.___ 15.___

Name: _____ Contact tel. or e-mail: _____
Department: _____ PRIZES will be awarded (must get 10 correct).

Thanks for your quiz participation and for supporting Mother Earth

Appendix 5
The Case for Authentic Assessment

Grant Wiggins - This article is based on materials that he prepared for the California Assessment Program.

WHAT IS AUTHENTIC ASSESSMENT?

Assessment is authentic when we directly examine student performance on worthy intellectual tasks. Traditional assessment, by contract, relies on indirect or proxy 'items'--efficient, simplistic substitutes from which we think valid inferences can be made about the student's performance at those valued challenges.

Do we want to evaluate student problem-posing and problem-solving in mathematics? experimental research in science? speaking, listening, and facilitating a discussion? doing document-based historical inquiry? thoroughly revising a piece of imaginative writing until it "works" for the reader? Then let our assessment be built out of such exemplary intellectual challenges.

Further comparisons with traditional standardized tests will help to clarify what "authenticity" means when considering assessment design and use:

* Authentic assessments require students to be effective performers with acquired knowledge. Traditional tests tend to reveal only whether the student can recognize, recall or "plug in" what was learned out of context. This may be as problematic as inferring driving or teaching ability from written tests alone. (Note, therefore, that the debate is not "either-or": there may well be virtue in an array of local and state assessment instruments as befits the purpose of the measurement.)

* Authentic assessments present the student with the full array of tasks that mirror the priorities and challenges found in the best instructional activities: conducting research; writing, revising and discussing papers; providing an engaging oral analysis of a recent political event; collaborating with others on a debate, etc. Conventional tests are usually limited to paper-and-pencil, one- answer questions.

* Authentic assessments attend to whether the student can craft polished, thorough and justifiable answers, performances or products. Conventional tests typically only ask the student to select or write correct responses--irrespective of reasons. (There is rarely an adequate opportunity to plan, revise and substantiate responses on typical tests, even when there are open-ended questions). As a result,

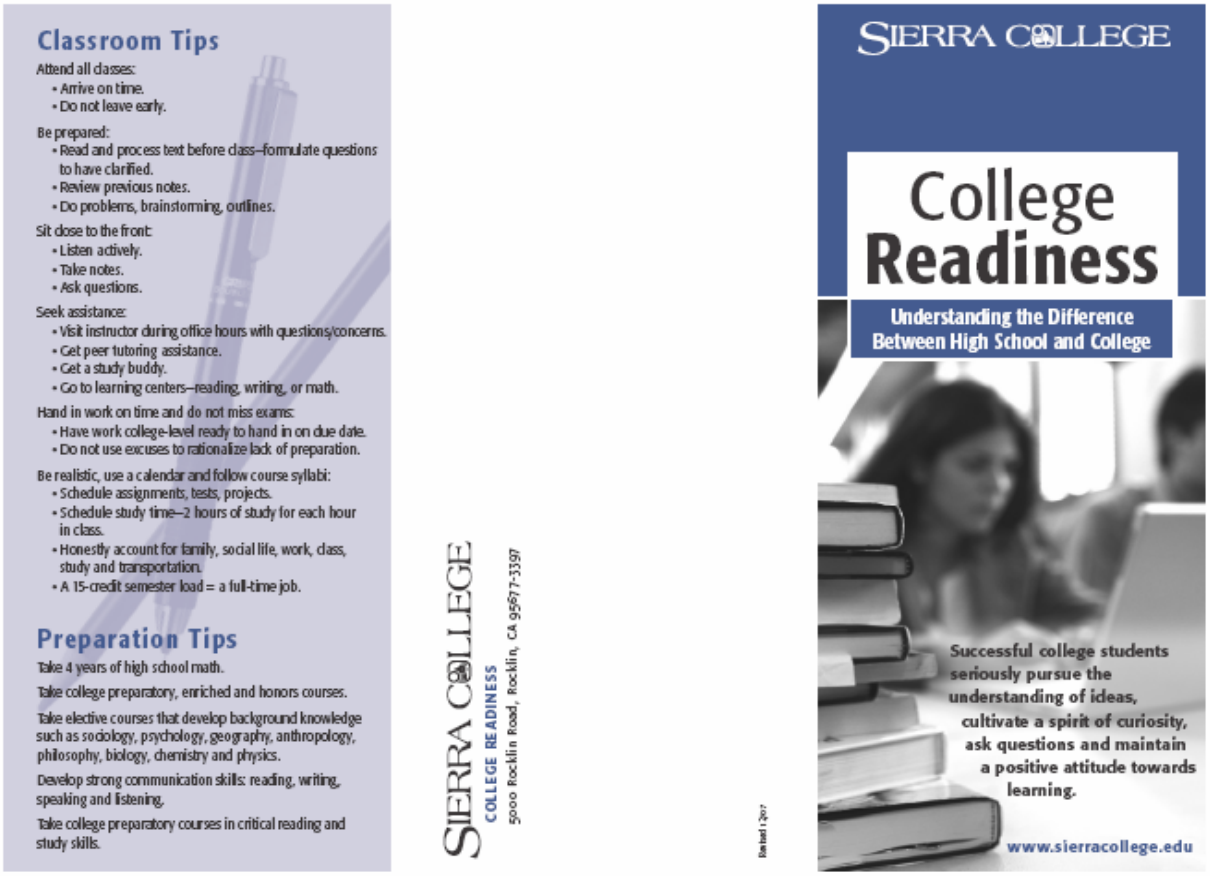
* Authentic assessment achieves validity and reliability by emphasizing and standardizing the appropriate criteria for scoring such (varied) products; traditional testing standardizes objective "items" and, hence, the (one) right answer for each.

* "Test validity" should depend in part upon whether the test simulates real-world "tests" of ability. Validity on most multiple-choice tests is determined merely by matching items to the curriculum content (or through sophisticated correlations with other test results).

* Authentic tasks involve "ill-structured" challenges and roles that help students rehearse for the complex ambiguities of the "game" of adult and professional life. Traditional tests are more like drills, assessing static and too-often arbitrarily discrete or simplistic elements of those activities.

Wiggins, Grant (1990). The case for authentic assessment. *Practical Assessment, Research & Evaluation*, 2(2). Retrieved February 16, 2004 from http://PAREonline.net/getvn.asp?v=2&n=2 .

Appendix 6
Sierra College Brochure



Classroom Tips

Attend all classes:
- Arrive on time.
- Do not leave early.

Be prepared:
- Read and process text before class–formulate questions to have clarified.
- Review previous notes.
- Do problems, brainstorming, outlines.

Sit close to the front:
- Listen actively.
- Take notes.
- Ask questions.

Seek assistance:
- Visit instructor during office hours with questions/concerns.
- Get peer tutoring assistance.
- Get a study buddy.
- Go to learning centers–reading, writing, or math.

Hand in work on time and do not miss exams:
- Have work college-level ready to hand in on due date.
- Do not use excuses to rationalize lack of preparation.

Be realistic, use a calendar and follow course syllabi:
- Schedule assignments, tests, projects.
- Schedule study time–2 hours of study for each hour in class.
- Honestly account for family, social life, work, class, study and transportation.
- A 15-credit semester load = a full-time job.

Preparation Tips

Take 4 years of high school math.

Take college preparatory, enriched and honors courses.

Take elective courses that develop background knowledge such as sociology, psychology, geography, anthropology, philosophy, biology, chemistry and physics.

Develop strong communication skills: reading, writing, speaking and listening.

Take college preparatory courses in critical reading and study skills.

SIERRA COLLEGE
COLLEGE READINESS
5000 Rocklin Road, Rocklin, CA 95677-3397

SIERRA COLLEGE

College Readiness

Understanding the Difference Between High School and College

Successful college students seriously pursue the understanding of ideas, cultivate a spirit of curiosity, ask questions and maintain a positive attitude towards learning.

www.sierracollege.edu

Student Responsibility

HIGH SCHOOL Teacher Supported	COLLEGE Student Directed
High schools and teachers require attendance.	Successful students attend all classes although attendance may not be required.
Teachers remind students of assignments, tests, & make-up work.	Students complete assignments & take tests on time.
Teachers tell students what to learn.	Successful students determine what to learn and know how to study using their own learning styles.
Teachers… • Summarize main ideas. • Outline notes. • Provide study guides. • Formulate questions.	Successful students… • Use effective textbook reading skills to learn content. • Take effective notes & study them regularly. • Create their own study guides, maps and graphic organizers. • Generate questions & answers from varying perspectives.
Teachers guide research and the location of information.	Successful students possess library and internet research skills.
Teachers give students supplementary information.	Successful students seek background information or supplementary resources.
Teachers monitor student performance by providing grade sheets.	Successful students monitor their own performance and set improvement goals.
Teachers discipline inappropriate talking in class.	Teachers do not tolerate inappropriate talking in class.
Teachers usually require less outside studying than college.	Successful students study 2-3 hours for each one hour of class time.
Teachers provide in-class study time and students often study with many distractions.	Successful students use study areas on campus and create a study area at home.
Others schedule a student's time for classes, sports and work.	Successful students must develop personal time management systems for college classes, study time, work and social life.
Students often choose elective courses based on interest.	Successful students choose courses based on program, degree, or transfer requirements.

Resources and Support

HIGH SCHOOL Teacher Parent Directed	COLLEGE Student Directed
Students have daily contact with teachers and receive regular feedback.	Successful students must actively seek feedback from teachers.
Teachers and parents direct academic accommodations and services for students with special needs.	Successful students seek out academic accommodations and special assistance.
Teachers provide extra help.	Successful students seek out peer tutoring and further academic assistance during instructor office hours.
Friends and family support students.	Students may not be in contact with a family support system and need to create a new support system.

HIGH SCHOOL Teacher Structured	COLLEGE Student Structured
Teachers usually give structured assignments with explicit directions.	Successful students organize and interpret assignments and conduct research independently.
Teachers often use T/F, multiple-choice and short answer test formats.	Teachers give complex exam questions requiring analysis, application and synthesis of ideas and theories using multiple-choice and essay formats.
Teachers give frequent tests and provide make-up tests and retakes.	Teachers give fewer tests (2-3 per semester) and generally do not allow for make-ups or retakes.
Grades are based on quality, completion and effort given to all assignments.	Grades reflect the quality of the product & adherence to college-level thinking and writing.
Teachers offer extra-credit opportunities to improve grades.	Teachers may not offer extracredit.

Academic Environment

HIGH SCHOOL Student Focused	COLLEGE Content Focused
Teachers give short lectures that often duplicate reading assignments.	Teachers present extended lectures that supplement assigned readings.
High school classes are usually limited to 30 or fewer students.	College classes are usually larger with 40–100 plus students.
High school classes meet daily.	College classes meet 2-3 times per week.
Teachers provide necessary background knowledge.	Teachers assume students have background knowledge and skills.
Teachers focus student learning with questions.	Teachers expect students to generate questions.
Teachers cover all content in class.	Students are responsible for all material whether or not it is presented in class.
Teachers provide organization.	Students must have systems of organization for all assignments, notes and handouts (notebooks/ folders)

Contact Information

For more information on Student Success
at Sierra College, contact:
Nancy Cook, Academic Foundations Program Coordinator
Office: Tutor Center, LRC 402 (Rocklin)
(916) 781-0476 • ncook@sierracollege.edu

Appendix 7
Other Examples of Assessments that Target Student Metacognition

Many of the Classroom Assessment Techniques described in Chapter 15 of this handbook are directed at student self-assessment within specific disciplines.

Student journals or log books can be a form of self evaluation about their own thinking and learning.

Another student checklist based on self-regulated learning (SRL) that could be used in class as an interactive exercise is below. You could have the students decide in groups which of the following strategies were most helpful, least helpful, easiest or hardest to do and have a class discussion. Alternatively you could use this as a discussion after the first exam to address student responsibility and growth.

Steps to College Success

Successful Students Know Their Responsibilities—

- Create an organization system
- Attend class regularly
- Complete assignments and test on time
- Get help early
- Learn how to study
- Know what services are available and where they are
- Learn effective note taking and how to review notes
- Create effective study guides
- Learn how to become an active learner
- Learn library and internet research skills
- Take responsibility for your own learning
- Monitor your own performance and set improvement goals
- Study 2 to 3 hours for each one hour of class time
- Learn accepted college classroom behavior (be on time, no extraneous talking, no headphones, cell phones, etc.)
- Use campus study areas
- Use study groups
- Ensure a quiet place to study
- Learn time management
- Create an educational plan to reach your goals

Successful Students Understand How College Works—

- You are responsible for information in assigned readings whether or not teachers discuss it in class
- You are responsible for class content or activities even if you're absent
- There is no such thing as an excused absence
- Classes may be large
- You are responsible for closing gaps in your background knowledge and skills
- Ask questions

Successful Students Access Resources and Support—

- Seek help from instructors by appointment or in office hours
- Get special help and accommodations if you have special needs
- Seek out peer tutoring support
- Create an on-campus support system
- Regularly seek counseling and advising
- Access financial aid support and services
- Get involved in campus activities

Successful Students Understand College-Level Work Expectations

- Ability to independently organize and interpret assignments
- Ability to conduct research independently
- Ability to complete exams that require analysis, application, and synthesis of ideas and theories in multiple choice and essay format
- Teachers give fewer tests and don't have to allow make-ups and re-tests
- Grades reflect the quality of the work produced in adherence with college-level thinking and writing—not just effort and attendance
- Teachers may not offer extra credit
- Do their own work
- Understand what plagiarism is and how to appropriately cite sources to avoid it

Crafton Hills College Holistic Student Self-assessment

Another student self-assessment is shown below. Developed by Gary Williams from Crafton Hills College, it is used in conjunction with a student success factors survey given to EOPS and Learning Community students. This rubric helps key students into holistic factors that ensure college success. Information about the holistic survey and diagnostic use of the information is provided in Chapter 4.

Responsibility • I realize that ultimately, I am responsible for my own success in college. • I make decisions and take timely action to advance my own educational goals. • When I make mistakes or bad choices, I take time to learn from these experiences.	**Wellness** • I practice sound habits to take care of my health, nutrition, exercise and stress management. • I get enough sleep, and I take time to relax every day • I ask for help when I find my life is becoming too stressful.
Motivation • I am determined to graduate from college and be successful. I have personally important reasons to succeed. • I am motivated to do my best in classes, and I have strategies that work for me. • My desire to be successful helps me to overcome any obstacles I encounter.	**Time Management** • I carry a calendar with me, and I write my commitments and important tasks in it each day. • I make a "to-do" list, and I take time to decide what tasks are most important to get done each day. • I balance all the important parts of my life in a way that allows me to get all the most important things done.
Task Precision • I am able to break down big projects and assignments into specific tasks. • I strive to complete tasks and assignments with a high degree of precision. • I strive to be concise and specific when I speak and write in my classes.	**College Involvement** • I seek opportunities to get involved in the life of the college. • I have made a lot of friends on campus, and I know faculty and staff who I can turn to when I have questions. • I want my college experience to be enjoyable and valuable.
Expectations • I have goals in college that are challenging and meaningful to me. • I know that I must work hard in order to be successful. • I seek opportunities to try new ideas and experiences, even when my peers might not go along with me.	**Personal Support Structure** • The most important people in my life understand my educational goals and life ambitions, and support me in my efforts. • I share my successes and challenges with the people who are important to me, and they feel connected to my college experience. • I encourage and support others in their desire to pursue college, and I am willing to share what I know about college with others.

Exam Post-Mortem-Another Self-assessment technique is to have the students assess their performance on an exam using the sample exam postmortem below.

Exam Post Mortem

For Exam number _____

Percent on Previous Exams _____ _____

1. How would you compare your preparation for other exams to your preparation for this exam?

2. Which part of the exam evaluates what you know and understand best? Circle an answer or answers and explain why.

Multiple-choice	**Matching**	**Fill in the Blank**
Short Answer	**Lab practical type questions**	**True/False questions**
Skills tests	**Case Study questions**	**Essay questions**

Why?

3. Circle any strategies you feel that worked best to prepare you for the test.

Group study sessions	**Reviewing class notes**	**Online study activities**
Highlighting in text	**Flash cards**	**Rewriting text & class notes**
Practice quizzes	**Rereading chapters**	**Reviewing the labs**
Studying the course objectives	**Flow charting on a whiteboard**	
Other:_____	Why?	

4. The final exam will be comprehensive. Which strategies will help you with deep or long-term learning now for the final exam? Put an asterisk by the strategies above and explain why in the space below.

5. Did you use the strategies you determined to use after the last post mortem?

6. How will you change your studying for the next exam?

Any of these techniques will give students with basic skills needs a means to accelerate their learning. If you have other methods of metacognitive assessment that you have used successfully in your courses or departments, don't forget to complete the new Academic Senate BSI survey. As was explained in the Introduction to this handbook, the Basic Skills Initiative, funded by a grant from the California Community Colleges Chancellor's Office, is developing a web-based resource to showcase successful programs, strategies, and projects that increase success rates of basic skills level students, and professional development programs. In order to list your strategy, you must describe it as part of the BSI survey. The survey link is: http://bsi.cccco.edu/

Appendix 8

Tailoring Assessment to Student Learning Styles

A Model for Diverse Populations

By James Anderson

What are learning styles? "Learning style" refers to the preferred manner in which an individual or group assimilates, organizes, and uses information to make sense of the world, including a classroom or job environment.

Learning styles can be characterized by how we prefer to learn, specifically our preferences for:

- The type of information we receive (sensory vs. intuitive);
- How we perceive information (visual vs. verbal);
- How we organize information (inductive vs. deductive);
- How we process information (actively vs. reflectively); and
- How we understand information (sequentially vs. globally).

There are many dimensions of learning styles, including:

- Reflective vs. Impulsive
- Non-affective vs. Affective
- Elaborative vs. Shallow (repetitive) processing
- Scanning (visual) vs. Focusing
- Field-independent vs. Field-sensitive
- Analytical vs. Relational
- Independent vs. Dependent
- Participant vs. Avoidant

Learning Styles as Continuums

I may have given the impression that learning styles fall into bipolar distributions — either students are visual learners or they're not, affective learners or they're not. In reality, learning styles are on continuums. We all have a learning style on each continuum, just in different places along the line. And there are instruments that allow us to identify where students are on these continuums.

Which learning styles are most effective? We have determined from research that students who are reflective, non-affective, elaborative-processing, scanning, field-independent, analytical learners are highly successful in both two-year and four-year colleges. They are our dream students. If they also come with a 1450 SAT and several Advanced Placement courses, their instructor can walk in every day and say anything, and they're going to get it. But in the real world, we want all of our students to succeed, not just those primed for success.

An Evolving Discussion

The discussion of learning styles has not moved with the same impetus that many other discussions in higher education have. The discussion of learning communities, for example, has moved from a conceptual model to an implementation model; discussions of teaching have moved to discussions of the scholarship of teaching. We have moved at warp speed in developing models for classroom

assessment, but, again, we have not followed suit in developing assessment models that accommodate learning styles.

Why has the evolution of our ideas about learning styles moved at such a slow pace? I offer four reasons.

The first is that our conceptual models of learning styles have become locked into the places where they originated as research topics: cognitive psychology, visual perception, etc. Because they are locked in as research topics, they have not yet been applied significantly to teaching and learning at a practical, performance-based student level.

The second reason that our conceptual models of learning styles have not evolved is because we haven't connected them to classroom performance, writing, thinking, student success indicators, retention models, and so on. These connections do show up in the literature, but they're not an integral part of our dialogue.

The third reason is because many campuses are not yet student-centered. If a campus is lax in merely thinking about what good teaching is, and if it lacks a student-centered approach to teaching and learning, why would it want to examine student learning preferences, learning strategies, and learning styles?

The final reason I offer (and mine is not an exhaustive list) is because to discuss learning styles in earnest is ultimately to discuss differential performance of certain groups and the relationship between traditional teaching styles and the learning styles of diverse populations. Now we've moved from a research discussion to a political discussion. And if faculty don't want to address student-centered teaching, why would they want to address the politics of teaching and its connection to different groups?

Advancing the Conversation on the Needs of Diverse Learners

We all accept the notion that when we teach or engage in any type of academic support, not all of our students have the same needs. All students have diverse needs that we want to meet. We want them to be better thinkers, better writers, better problem solvers, and so on.

Then there are particular groups of students who have unique needs that we also want to meet. Consider a returning adult who is less skilled, raising a family and working full time. If, because of poor advising, this student gets a full load of tough courses with abstract course content, he has a 100 percent chance of getting a D or F in almost every one of those courses.

So why haven't we looked out for the unique needs of certain diverse learners? One reason that diversity is not considered in many campus discussions of teaching, learning, assessment, scholarship, and research is that we ignore its natural fit with these endeavors. To see how easily diversity can be incorporated into discussions of learning style, recall how visual learners learn best: by drawing on personal, social, and cultural experiences to make the learning experience more holistic. By noting this, we have introduced diversity into the conversation on learning styles.

Cultural Differences in Learning Styles

When I began to study learning styles, the first thing I discovered was that there was no literature on

group differences, with the exception of some work on differences in such things as visual perception, field independence, and field sensitivity. There were also some comparisons of Eurocentric groups with other groups — for example, Scottish children with Zambian children — but nothing connected to classroom performance, higher-order skills, etc.

But today we know a lot more. Do certain racial, ethnic, or cultural groups lean more toward some ends of the continuums than others do? Yes. Differences in learning styles are so pronounced that we can make clear distinctions among cultural groups, racial groups, gender groups, age groups, and so on. Students from certain groups tend to be disproportionately relational, affective learners. In the late 1980s, I leaned toward thinking there was something called a "Black Learning Style" or "Women's Learning Style."

But I've changed since then. If I could select two factors that probably have the most impact on students' learning styles and group differences, it would be class and prior educational experiences, be they in the family or in school. If you map the learning styles of whites in Appalachia and blacks in Mississippi, they'll look exactly alike. If you map the learning styles of students of color at Reed College in Oregon and at Harvard, again they'll map in similar ways . . . that is, bright, analytical students, regardless of race, will show up that way.

Some researchers are beginning to focus on a broader approach that identifies other dimensions of learning styles. Madge Willis, in her February 1989 article "Learning Styles of African-American Children: A Review of the Literature and Interventions" in the *Journal of Black Psychology*, for example, talks about learning styles of African-American children:

- Social/Affective: They tend to be people-oriented and emphasize the affective domain. Social interaction is crucial, and social learning is common.
- Harmonious: They tend to respect and encourage the interdependence and harmonic/communal aspects of people and environment. They seek knowledge for practical, utilitarian, and relevant purposes. They seek synthesis and holistic approaches to experiences.
- Expressive Creativity: They tend to be creative, adaptive, variable, novel, stylistic, and intuitive. They prefer simultaneous stimulation of multiple senses and oral expression.
- Non-Verbal: Non-verbal communication (intonation, body language, movement, and rhythm) are vital to helping these students learn.

Should We Encourage Students to Change Their Learning Style?
Students come to us with learning styles developed over many years, rooted in their culture, family background, and prior educational experiences. Do we want to go as far as I've suggested in studying group differences in learning styles? In doing so, are we suggesting that some groups are deficient in learning style? Of course not. We don't make evaluative judgments about learning styles; we affirm learning styles as a reflection of a student's heritage.

But should we nonetheless encourage some students to modify their learning style? Yes, because we live in the real world. The students who will be most successful in college move from the affective toward the analytical side. I look at the performance of affective students in tough courses, especially when they are dragging their affect into the classroom when it doesn't need to be there — i.e., they can express their affect anywhere else, but in that classroom they need to be very focused.

It is not necessarily difficult to modify one's learning style. Most of us can move up and down these continuums, and we know exactly when we should do so. When we're in a restaurant with friends, for example, there's no need to have a highly analytical discussion about the caloric breakdown of everything that's on our plate or about the class differences among the people sitting around us. But if you're giving a conference presentation, you're going to move toward the analytical end of the continuum because you're addressing high-end, well-heeled learners.

We all have the jobs we have because we're good at this higher education thing. If there's one thing we can share with students to help them learn, it's how to move up and down these continuums.

What about students who are highly analytical and devoid of affect? Don't they need to move to the affective side? Yes, they do at some point in life, but not necessarily while they're getting through college courses.

The Importance of Framing Questions

What are the implications of all this for each of us? If you want to develop an assessment model that addresses the needs of diverse populations, the most important thing that you can do is frame the questions that you want answered. What do you want to know? Why?

Here are some examples of framing questions to ask yourself:

- Do we seek only to identify students' attitudinal dispositions toward learning, without connecting them to teaching?
- Do we only want to know how students feel about learning and their learning preferences?
- Does our faculty have an understanding of general learning styles? (If we're at an open-admissions institution, how can they not have an understanding, since every day in every class there is such a wide range of learners sitting in front of them across different dimensions, skill levels, learning styles, learning preferences, and motivational levels?)
- Who impacts faculty perceptions of student learning styles?
- Do we want to assess our students' learning styles? Whose responsibility is it to do

this and get the information to faculty so they understand their students' needs?

- If we do collect such information, so what? What do we want to do with it?
- For those whom we identify as being most at risk for success, based on valid,

objective information, what does it mean? What are we doing about it?

- How can we move less successful students incrementally through a process that allows them to become more successful? How do we move students from being affective to being more analytical?
- Should we adapt instructional styles to accommodate learning styles? What does that mean for faculty development? What does that mean for classroom assessment?
- What cognitive, affective, and cultural assets do diverse students bring to learning environments, and how do these assets facilitate or inhibit their performance? How can we tap into those assets?
- How do all aspects of diversity fit into assessing performance?

- To what degree do we want to assign students to sections according to styles and then match them up with certain instructors? Why should students who are less-skilled and affective learners be placed with a highly analytical instructor?
- Should we use information about learning styles to help students decide what to emphasize or de-emphasize in their studies? Students who take an entire semester online and who are highly verbal and less visual in learning preference may experience difficulty. Can a student who's a highly affective, relational learner succeed at a Research I institution, where most of the faculty she encounters in mathematics, science, and technical areas will teach in an analytical manner?
- Should the relationship of learning style research to educational outcomes affect what we do with faculty development?
- What new assessment methods are needed?
- Where's the next frontier to help us accurately evaluate and portray learning styles as they are impacted by diversity?

Once we've considered these kinds of questions, we can begin to think about reasons for not only doing more learning style assessment but also incorporating diversity. We may want to give students a learning styles-preference survey simply to give self-assessment feedback to students, so they can see themselves, maybe for the first time ever, as a learner.

We can go from there to doing cohort comparisons, looking at clusters of behaviors that we see in groups. For example: What clusters of behaviors are associated with success or failure in beginning science or math courses? What clusters of behaviors are associated with success or failure across what groups in engineering?

Next Steps

We are slowly moving from a generic model of learning style to a more comprehensive model that incorporates the diverse needs of all students and the unique needs of diverse groups, including their learning styles.

There is currently no effective assessment of learning styles and diversity that will enlighten us in significant ways about student performance, student success, student learning, etc. I'm working on an instrument that has been pilot-tested for reliability and validity at five institutions, and we will soon be pilot-testing it at five more. We're trying to develop an instrument that profiles generic learning styles and also correlates that information with other critical dimensions, such as student-student interaction and student-instructor interaction.

Given limited resources, what steps can institutions take to better address the needs of diverse learners? Begin by developing a strong teaching initiative around a more general area and then incorporate attention to diverse learning styles into it. At North Carolina State, a group called the Hewlett Fellows focuses on inquiry-guided teaching and promoting active learning. Faculty are very enthused about it. But if we had first tried to develop a learning style initiative focusing on effective teaching, I predict it wouldn't have been as successful.

Another possibility is to create cooperative clusters or learning communities, provided that they are designed to accommodate diverse groups. Diversity is not as present as it should be in learning community research. There's an inherent assumption that learning communities automatically

account for diversity, but that's not true. For example, if you set up voluntary curricular learning communities, diverse students will not necessarily sign up. They do not see the inherent value of clustering across courses.

Cooperative clusters show promise, however. Sheila Tobias has studied cooperative clusters associated with the success of women in science and mathematics. (See her books *Revitalizing Undergraduate Science: Why Some Things Work and Most Don't* and *They're Not Dumb. They're Different: Stalking the Second Tier*, both published by Research Corporation, Tucson, Arizona.) Uri Treisman has done the same with underrepresented students and students of color, especially in mathematics. (See his article "Studying Students Studying Calculus: A Look at the Lives of Minority Mathematics Students in College" in the November 1992 *College Mathematics Journal*.)

But cooperative learning models don't attract everyone. A student who is introverted and less-skilled and doesn't understand the culture of college is not going to be assertive in cooperative learning approaches. That student will not participate actively in learning communities, and that student will be silent in chat rooms.

It's a challenge to address the needs of diverse learners, because it's so difficult to reallocate resources from things that aren't really significant and don't yield outcomes of consequence. But we should do faculty development on this subject, and we should have something for students coming into our institutions who historically have been identified as having the most problems. If we don't do that, why keep bringing them in? They'll just continue having problems. These are two areas in which we should all invest resources.

James Anderson is vice provost and dean of undergraduate affairs at North Carolina State University. Contact him at james_anderson@ncsu.edu.

This article comes from the new American Association of Higher Education (AAHE) book *Assessment to Promote Deep Learning*, edited by Linda Suskie, former director of AAHE's Assessment Forum. The book is a compilation of the major presentations from AAHE's 1999 and 2000 Assessment Conferences.

This article is excerpted from James Anderson's session "Developing a Learning-Style/Teaching-Style Assessment Model for Diverse Populations," presented at the 2000 AAHE Assessment Conference.

Assessment to Promote Deep Learning is available for $12 for members ($14 for non-members), plus shipping, through AAHE's online publication catalog, or order by phone, (202) 293-6440, x780.

Appendix 9
Grading Student Group work

Teamwork Grading Sheet		
Team Member Name	Specify the work done and time involved (e.g. research 2 hours, typing 4 hours, interviews 30 minutes, etc)	Signatures of every other team member

Appendix 10
Resources for Chapter 5

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