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Teach Me, Teach My Brain
A Call for Differentiated Classrooms

Three principles from brain research—emotional safety, appropriate challenge, and self-constructed meaning—suggest that a one-size-fits-all approach to classroom teaching is ineffective for most students and harmful to some.

A few years ago, I eagerly signed up for a one-day computer class on using a particular graphics and layout program. I was highly motivated: I had an immediate need to know the content, was excited about becoming more competent with computers, and had invested heavily in the success of the day through paying a hefty tuition and making a long, early-morning drive in heavy traffic.

The instructor knew his stuff. I know that because he talked nonstop throughout the day and never seemed (as far as I could tell) to repeat himself. As we sat at computers, he told us step-by-step what to do. He had hooked up a computer to a projector so he could also show us, but he either forgot to do so or felt it unnecessary to demonstrate the obvious.

I missed the third instruction he gave us (probably 10 minutes into the morning) because I was still struggling to do the second step correctly. After that, my confusion escalated, and I alternated between desperation and thoughts of homicide for the rest of the morning.

I developed two coping strategies—trying to disguise my inability to make anything relevant happen on my computer screen and devising a way to develop at least a few modest competencies before the end of the day. My strategy to disguise my incompetence was to look at the man seated next to me and copy what he did. Unfortunately, he probably knew nearly as much as the instructor did and was using the morning to complete a layout of his own. He did have some questions that evidently weren't on the agenda, so he used a trial-and-error approach to solve his own problems.

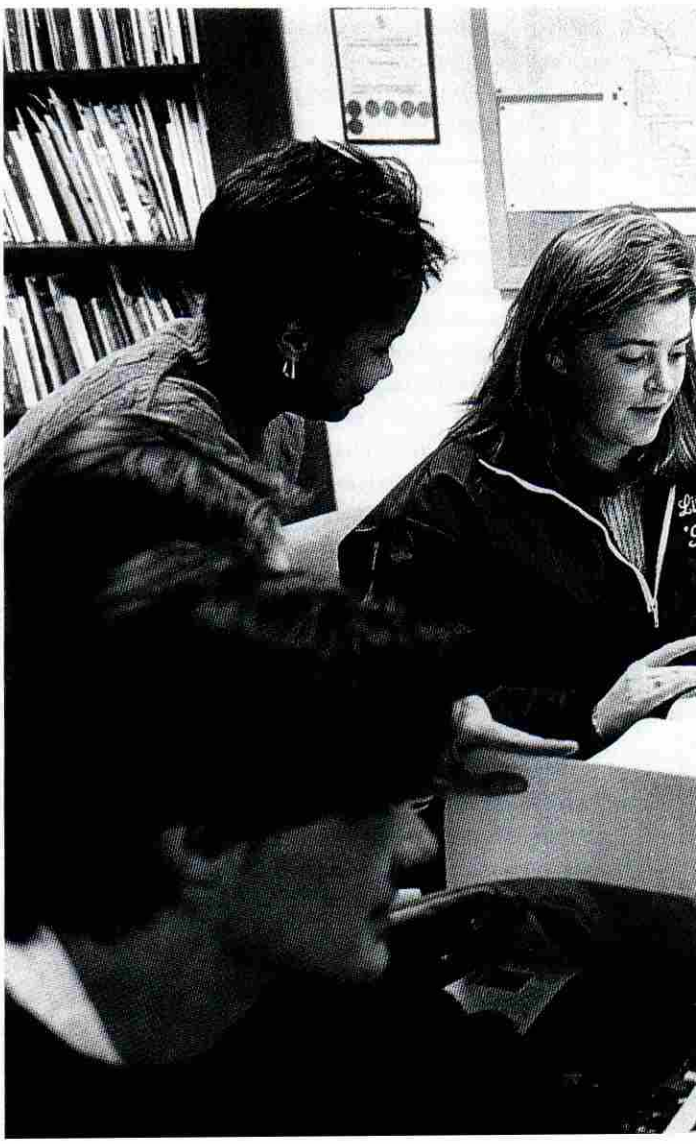
I planned to remediate my incompetence by photocopying the student manual during the midday break so that I could study it at my own pace at home. I couldn't make sense of the manual's many and complex ideas while the instructor jetted along and while I was trying to do something on the computer screen. That strategy also failed when the instructor locked all the student manuals in a closet until we returned from lunch.

At times during the day, I was angry at the teacher for not adjusting his instruction to fit my needs. (So, I assume, was the man seated next to me. He didn't return after lunch.) At other times, I despaired of ever mastering the computer. By the end of the day, I was exhausted.

I have never taken another computer workshop.

Our Students Go There Every Day

The computer workshop was a prime example of a one-size-fits-all classroom. Although the teacher was well-



meaning and knowledgeable, he had so much curriculum to cover, and so little time, that he saw no alternative to telling his students what he knew and assuming they would get it.

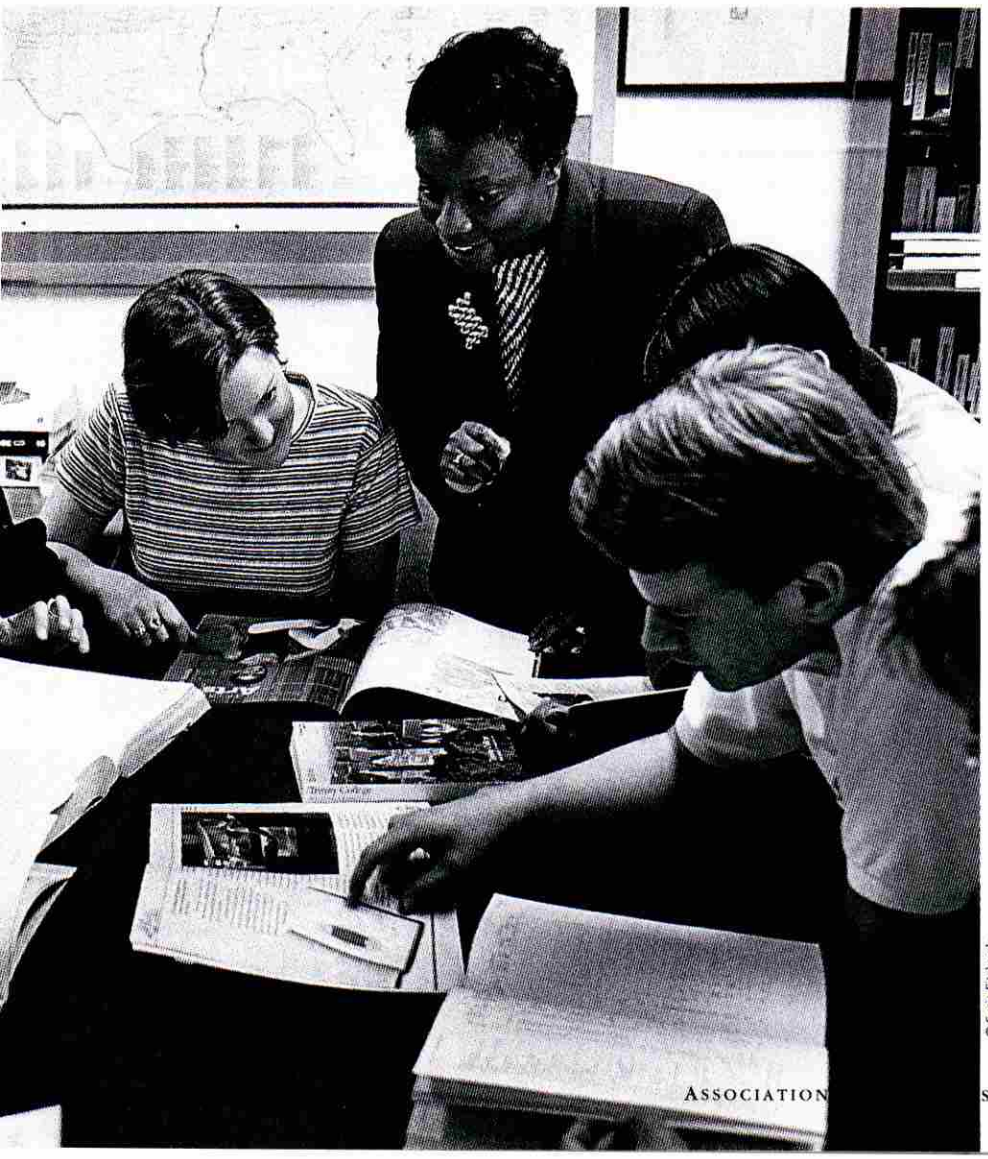
I know that the teacher lost a struggling learner who was highly motivated but who needed more repetitions of fewer ideas, more individual guidance, a clearer sense of why things work like they do in the software program, more time for hands-on problem solving, and more monitoring by the teacher. I feel fairly sure that he lost an advanced learner who needed less up-front information, an opportunity to ask his own questions, and a chance to use the skills he already had and to develop new ones through a relevant application.

> Differentiated classrooms are responsive to students' varying readiness levels, varying interests, and varying learning profiles.

Regrettably, most of our classrooms are too much like the computer workshop. Driven by a sense that they have too much to cover in too little time, teachers enter a classroom with a single lesson that they deliver to learners at a single pace and through a single instructional approach. As teachers, we make few, if any, modifications for struggling learners (Bateman, 1993) or advanced learners (Westberg, Archambault, Dobyns, & Salvin, 1993). We often disregard student interests and learning profiles (Gardner, 1994). We do one thing in one way and hope for the best, but for many of our students, it will not be good enough.

James Nehring laments,

> We assume in this country that all kids are the same. Of course no educated adult would ever say that, but the assumption is clearly there. It is embedded in our school system. . . . We force all kids through the same mold. If there is one thing on which both research and common sense agree, it is that kids are not the same, that they learn in different ways, that they respond to different kinds of incentives. (Nehring, 1992, p. 156)



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Why Attend to Individual Differences?

Nehring is correct that our common sense tells us that not all kindergartners are alike, that 4th graders vary, that middle schoolers are all over the place in how they learn, and that high schoolers bring into the classroom a span of readiness as broad as the number of years they have spent in school. He is also correct that if common sense isn't enough, research clearly tells us to attend to the individual when we teach. Recently, the amassed understandings about how the brain works have added to our considerable research base on the importance of developing and delivering curriculum and instruction that are responsive to individual learning needs.

Brain research suggests three broad and interrelated principles that point clearly to the need for differentiated

classrooms, that is, classrooms responsive to students' varying readiness levels, varying interests, and varying learning profiles.

1. Learning environments must feel emotionally safe for learning to take place. When a child feels intimidated, rejected, or at risk, an overproduction of noradrenalin causes that child to focus attention on self-protection rather than on learning. A fight or flight response may cause misbehavior or withdrawal, but it most certainly will not result in learning (Howard, 1994; Jensen, 1998; McGaugh et al., 1993).

What causes a child to feel unsafe or ill at ease in a classroom? A child who needs an accepting and relatively open learning environment but whose teacher runs a tight ship will feel intimidated. A student who asks probing questions only to see peers roll their eyes (and perhaps even the teacher as well) will feel rejected. A student whose first language is not spoken in the classroom, and who is largely left to his or her own devices to figure out what is going on, will feel mute and out of place. A child who simultaneously feels pressure from the teacher to excel and pressure from peers to reject the trappings of school will feel unsafe.

These responses are not willful, not imaginary. They are appropriate responses by a child to chemically induced changes in the brain signaling that the first order of business is self-preservation—not learning. Even as an adult in the computer workshop, I felt so inadequate, so afraid of displaying incompetence, that I spent more time trying to figure out how to cope than how to learn.

2. To learn, students must experience appropriate levels of challenge. This principle from brain research is closely related to the first one. If a student engages in a curriculum that is well beyond that student's level of readiness, stress results, and the brain overproduces key neurotransmitters that impede learning (Koob, Cole, Swerdlow, & leMoal, 1990). Conversely, if the curriculum is redundant for the learner—beneath that student's level of readiness—the brain is not inclined to engage or respond and, consequently, does not release the levels of dopamine, noradrenalin, serotonin, and other neurochemicals needed for optimal learning. The result is apathy (Shultz, Dayan, & Montague, 1997).

In the computer workshop, I had the former experience. The man who disappeared after lunch had the latter. Optimal learning takes place when the brain of a moderately challenged student produces an amount of neurotransmitters that facilitates rather than impedes learning (Howard, 1994; Jensen, 1998; White & Milner, 1992). The trouble with a one-size-fits-all classroom is that the lesson is pitched at a single challenge level, virtually ensuring that many students will be overchallenged or underchallenged and, therefore, will not learn.

A child who needs an accepting and relatively open learning environment but whose teacher runs a tight ship will feel intimidated.

3. Each brain needs to make its own meaning of ideas and skills. It is no more possible for a teacher to "make me understand" than for the teacher to digest food for me. Clearly the computer instructor's attempts to transmit to me his high level of understanding was ineffective. For the advanced learner next to me, the instructor's attempt was redundant.

The difficulty for teachers is that classrooms today are filled with students of diverse backgrounds, interests, and experiences. These students take in information through different channels, process ideas at different rates, and have varied preferences for modes of expression. What enables academically diverse students to make sense of essential understandings and skills? Brain research suggests at least two guidelines.

First, teaching that is based on concepts and the principles that govern them, in contrast with teaching that is rooted solely or largely in facts, is essential. Concept-based teaching increases the likelihood that each learner can construct and enhance frameworks of meaning, see the relationship between the parts and the whole of what is being studied, relate the subject being studied to his or her own life and to other topics (Kesner, Bolland, & Dakis, 1993), use the ideas more readily (Keverne, Nevison, & Martel, 1997), and retrieve and remember ideas and information better (Erickson, 1998).

Further, launching curriculum from key concepts and principles ensures that struggling learners focus on what is most important and powerful in the curriculum. It invites advanced learners to extend their understanding in a way that is meaning-rich instead of either repeating the known or engaging in often tangential or trivial enrichment.

Second, the brain learns best when it "does," rather than when it "absorbs" (Pally, 1997). Thus, all students must think at a high level to solve knotty problems and to transform the ideas and information they encounter.

What Does a Differentiated Classroom Look Like?

The three interdependent principles from brain research help us sketch what a differentiated classroom might look like. Certainly, these principles can be

translated in various ways appropriate to the developmental levels of students, the needs of teachers, and the nature of subjects. Nonetheless, some characteristics of academically responsive, or differentiated, classrooms derive from what we know about the brain.

- Students and teachers continually work to accept and appreciate one another's similarities and differences—to be respectful of one another.
- Teachers are hunters and gatherers who energetically continue to find out all they can about students' current readiness, interests, and learning profiles.
- Teachers use what they learn about students to provide varied learning options and build learning experiences around the important concepts of the content.
- All students take part in respectful learning experiences that are equally interesting, equally important, and equally powerful.
- Students use essential skills to address open-ended problems designed to help them make sense of key concepts and principles.
- Teachers often present several learning options at different degrees of difficulty to ensure appropriate challenge for students at varied readiness levels.
- Teachers often give students choices about topics of study, ways of learning, modes of expression, and working conditions.
- Teachers present information in varied ways, for example, orally, visually, through demonstration, part to whole, and whole to part. Instructional approaches invite attention to individual needs, for example, learning contracts, graduated rubrics, complex instruction, entry points, and problem-based learning.
- Students work as collaborators with classmates and teacher—to make sure everyone grows.
- Teachers serve as coaches who attend to individuals as well as to the whole class. The goals of teachers are to meet all students at their starting points and to move each one along a continuum of growth as far and as quickly as possible. Learning has no ceiling.
- Teachers may assign students to groups on a random basis or on the basis of similar readiness, mixed readiness, similar interests, mixed interests, similar learning profile, or mixed learning profile. Sometimes teachers constitute the groups on the basis of an assessed perception of need; sometimes students themselves select the groups.
- Teachers design homework to extend the individual's understanding and skill level.
- Varied assessment options are common, for example, portfolios, authentic problems to solve, oral presentations, and tests.
- Grades—or reports to parents, whatever form they take—are based, at least in large measure, on individual growth.

In classrooms where teachers work consistently to develop these hallmarks, students of varying backgrounds, experiences, interests, readiness levels, and learning profiles are highly likely to feel emotionally safe, experience appropriate challenge, and make sense of powerful ideas. In these brain-friendly classrooms, teachers build on our burgeoning awareness that to teach me well, you must teach my brain. ■

References

Bateman, B. (1993). Learning disabilities: The changing landscape. *Journal of Learning Disabilities, 25*(1), 29-63.

Erickson, L. (1998). *Concept-based curriculum and instruction: Teaching beyond the facts.* Corwin.

Gardner, H. (1994). Reflections on multiple intelligences: Myths and messages. *Phi Delta Kappan, 78*(5), 200-207.

Howard, P. (1994). *The owner's manual for the brain.* Austin, TX: Leornian.

Jensen, E. (1998). *Teaching with the brain in mind.* Alexandria, VA: ASCD.

Kesner, R. P., Bolland, B. L., & Dakis, M. (1993). Memory for spatial locations, motor responses, and objects: Triple dissociation among hippocampus, caudate nucleus, and extrastriate visual cortex. *Experimental Brain Research, 93,* 462-470.

Keverne, E. B., Nevison, C. M., & Martel, F. L. (1997). Early learning and the social bond. In C. S. Carter, I. I. Lederhendler, & B. Kirkpatrick (Eds.), *The integrative neurobiology of affiliation.* Annals of the New York Academy of Sciences, Vol. 807 (pp. 329-339). New York: New York Academy of Sciences.

Koob, G. F., Cole, B. J., Swerdlow, N. R., & leMoal, M. (1990). *Stress, performance, and arousal: Focus on CRF.* (National Institute on Drug Abuse Research Monograph No. 97-163176). LaJolla, CA: Research Institute of Scripps Clinic, Department of Neuropharmacology.

McGaugh, J. L., Introini-Collison, I. B., Cahill, L. F., Castellano, C., Dalmaz, C., Parent, M. B., & Williams, C. L. (1993). Neuromodulatory systems and memory storage: Role of the amygdala. *Behavioural Brain Research, 58,* 81-90.

Nehring, J. (1992). *The schools we have: The schools we want.* San Francisco: Jossey-Bass.

Pally, R. (1997). How brain development is shaped by genetic and environmental factors. *International Journal of Psycho-Analysis, 78,* 587-593.

Shultz, W., Dayan, P., & Montague, P. R. (1997). A neural substrate of prediction and reward. *Science, 275,* 1593-1599.

Westberg, K., Archambault, F., Dobyns, S., & Salvin, T. (1993). The classroom practices observational study. *Journal for the Education of the Gifted, 16,* 120-146.

White, N. M., & Milner, P. M. (1992). The psychobiology of reinforcers. *Annual Review of Psychology, 43,* 443-471.

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