

Teaching and Learning

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This chapter is dedicated to Dr. Dale Parnell, who in 1985 wrote The Neglected Majority, which launched a tidal wave of interest in students in the middle 50 to 65 percent as represented on traditional measures of academic success. At the time of its first printing, Dale was President of the American Association of Community and Junior Colleges (now AACC). Since that time he has taught education at universities and written several books (including Why Do I Have to Learn This and Contextual Teaching Works) to promote contextual teaching and learning.

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Why Do I Have to Learn This?

Teachers all over the world are often asked, “Why do I have to learn this?” Too often the response is, “Because you might need it someday.” Or worse, “Because it will be on the test.” Neither answer is satisfying to students, and neither inspires interest in learning.

What is the purpose of education? Should schools, especially public schools, be primarily in the business of instilling facts and developing so-called intellectual skills? Shouldn’t they have a more practical focus as well, preparing students for their “real world” of careers, grocery shopping, marriage, and the like? American education has always favored the priority of a “classical subject-matter education” in the tradition of the Greek philosopher Plato over the more practical, problem-oriented approach favored by Aristotle, and the inquiry method favored by Socrates. We hold to a broad definition of education that includes an understanding of how knowledge may be applied to real-life situations. The realities of living in today’s economy require students to experience a deeper

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and more meaningful education than has ever existed in our history. If we believe the primary purpose of education is to help each student become a fully competent, contributing, self-motivating, self-fulfilling member of our society, it is time to redirect our goals discussions toward a broader, more inclusive view.

No longer can the debate about academic education and career and technical education be allowed to degenerate into an either/or argument. They are both important, but, unfortunately, we have allowed a wide gap to exist between the two.

Why Are U.S. Students Falling Behind Other Countries?

The findings of the National Commission on Mathematics and Science Teaching for the 21st Century reflect what parents and employers have been saying for many years. Mathematics and science education are crucial. Unfortunately, it is not up to the standards needed. In reaction to our children’s poor performance on the Third International Mathematics and Science Study (TIMSS) and the National Assessment of Educational Progress (NAEP), the commission stated, “...It is abundantly clear...that we are not doing the job that we should do – or can do – in teaching our children to understand and use ideas from these fields. Our children are falling behind; they are simply not “world-class learners when it comes to mathematics and science.”¹

In Chapter 3, and in the Harvard Graduate School of Education project report *Pathways to Prosperity*, William Symonds et al. use data from 2009 to confirm what was already true in 2000. The 2009 OECD PISA assessment report reveals that the performance of U.S. students in science and math has not compared well with other countries (ranked 17th in science and 25th in math achievement).²

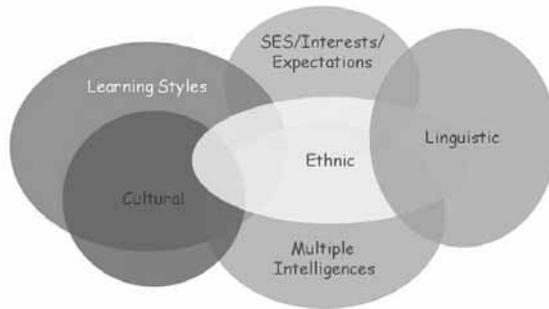
1 National Commission on Mathematics and Science Teaching for the 21st Century. *Before It’s Too Late: A Report to the Nation from The National Commission on Mathematics and Science Teaching for the 21st Century*. Jessup, MD: Education Publication Center, 2000, p. 4. Also available online at www.ed.gov/americaaccounts/glenn (accessed March 2012).

2 William C. Symonds, Robert B. Schwartz, and Ronald Ferguson (February 2011), *Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century*, Pathways to Prosperity Project, Harvard Graduate School

Population, environmental, and other changes

At the beginning of the last century, only 6% of appropriate-aged youth were graduating from high school. Seventy years later that had grown to about 75%. Today, with almost all youth being educated, we are driven to attempt to deal with a vast array of individual differences: in intelligence levels, in family and economic background, in cultural background, and in the ways individual students learn. The following diagram may show the challenge teachers are facing every day.

Do you feel/perceive this is your classroom?



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Yet, despite huge population changes in schools over the past 100+ years, the teaching process has changed very little. Many teachers continue to use traditional teaching methodologies. However, the world has changed, the technology has accelerated its pace, global markets are more complex, and global competition is tougher. Are teacher in sync with new requirements?

What Are the Challenges?

The “flat” world is asking for less content, deeper understanding, and a problem-solving attitude. A number of faulty ideas and unsound practices stand in the way of cultivating excellence throughout our schools.

of Education (http://www.gse.harvard.edu/news_events/features/2011/Pathways_to_Prosperty_Feb2011.pdf; accessed April 11, 2012).

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- Faulty images of excellence—There is little agreement among educational leaders about the definition of excellence in education.
- A diverse population—Anyone who has spent much time in a public school classroom can attest to the awesome array of individual differences among the students. The varieties of student aspiration and the multiplicity of socioeconomic and cultural backgrounds and experiences require multiple pedagogical approaches.
- “High standards”—Many ignore the fact that having “high standards” is only half the solution. The more important half is designing programs that help students meet those high standards.
- Fragmentation—Students are expected to go from class to class, subject to subject, even from grade to grade and school to school, with little sense of connection or continuity.
- Will it be on the test?—The testing movement, by and large, defies rational observation about how individuals learn and how effective education works. In fact, the word *test* has become a four-letter word for many teachers. Many tests provide few ways of evaluating whether students can solve problems, apply knowledge, or see things in the mind’s eye—all vital skills both for ongoing education and for success beyond the classroom.
- Too much to cover!—Exposing students to more material does not mean they will learn more. More likely, attempting to “cover the material” in a packed curriculum usually means that the students receive only a superficial exposure to a massive amount of information and learn nothing in depth. Contextual learning advocates moving away from the “more is better” theory in curriculum building, teaching, and learning, toward a theory of “go deeper rather than wider.”
- Conventional pedagogy prepares a relatively small number of students—those considered “smart”—to use “head skills,” while relegating everyone else to the acquisition of “hand skills.” Unfortunately, the two groups are not considered merely *different*. Those who can easily learn “head skills” are considered superior. This is clearly a case of *pedagogical inequity*.

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Pedagogical inequity is unfair and irrational. It is a very real problem that demands a solution. One cause of the problem is that conventional pedagogy mistakenly views “head skills” and “hand skills” as incompatible. They are not. It is possible to teach in such a way that both types of skills are developed – and fairness demands that we try to do so.

False assumptions about learning

Many educators tend to interpret the learning environment according to their own experience as students. In other words, they teach the way they have been taught – usually through traditional abstract lecture methods. As part of these abstract lecture methods, we found that teachers strongly believe and trust that only when they talk about a topic, students miraculously learn it. Those faculty members may base their methods on one or more false assumptions:

- *People automatically transfer learning from one situation to another.* Contextual teaching methods would allow students to have experiences where they can see how knowledge from academic classes is used in a potential career field.
- *Learners are passive receivers of wisdom – empty vessels into which knowledge is poured.* Students in a passive classroom may miss the most important means of learning – exploration, discovery, and invention.
- *Learning is the strengthening of bonds between stimuli and correct responses.* This misconception is based on a behaviorist approach to education, which tends to reward response instead of understanding. This way may be good for a minority of students – not more than 15%.
- *What matters is getting the right answer.* Students who focus primarily on getting the right answer tend to rely on memorized shortcuts instead of acquiring the problem-solving skills they will need in a real-life setting. Maybe if problems were defined as in the real world, there will be no need for a unique right answer. This will help students to think about the practical significance of the answer.

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- *Skills and knowledge, to be transferable to new situations, should be acquired independent of their contexts of uses.* The process of abstracting knowledge, or taking it away from this specific context, has long been thought to make that knowledge more useful to a number of situations. However, such decontextualization can easily rob students of a sense of motivation and purpose.

Measuring success involves more than rote memory

How do you know that they know? Most teachers understand that the most important part of learning is what students can do with what they know. Yet, paper-and-pencil tests are identified as the primary method for determining a student's grade. Caine and Caine suggested that, by overextending the rote memory capacity of students through memorization with no connection to application, educators impoverish the learning and interfere with the development of understanding.³ Assessment may be considered authentic if the assessment is an activity that is known to occur in areas of life other than school.

Schools must define their expectation for student learning so that they may decide what will be taught. Business and industry can help schools decide "what" to teach, or at least what to teach **first**. Once a determination is made as to which student expectation should be taught, the critical question arises: what level of proficiency indicates success? To assess how well students are doing, educators must look at a variety of sources that provide evidence of student performance. Classroom-based measures include profiles, portfolios, exhibitions, projects, diagnostic assessments, and assessments that cover subject skills, concepts, and knowledge. Teachers need to identify which data to collect and decide how to analyze that data to support the ultimate goal of focusing school improvement efforts.⁴

The most valuable form of assessment reflects the students' current understanding of key concepts and simulates authentic life-related tasks. Assessment is authentic when it is focused and based on what people do in real situations. It is only in using knowledge in challenging situations that replicate or are based in day-to-day life that

3 Caine and Caine.

4 Daggett.

students truly demonstrate what they know. Authentic assessment is a key ingredient in contextual teaching and learning. Assessment should not be based simply on rote memory.⁵

Common vision and goals needed

According to Dr. Willard Daggett, Founder and Chairman of the International Center for Leadership in Education, the rate of change in society is four to five times faster than the rate of change in our schools. As we decide how to respond to our changing world, we must understand that the rest of the world will not stand still while we think about how to address our challenges.

It's been almost thirty years since the release of *A Nation At Risk* which accentuated the need to provide *all* students with academically rigorous and relevant education. Most people would agree that this is the direction American education needs to go in; however, we are finding it easier to conceptualize change than to implement it.⁶

What Does the Research Say?

It is important that educators fully understand the breathtaking power of the human brain to make meaningful connections between knowledge and the application of that knowledge, between knowing and doing, and between content and context. Since the brain tends to discard information for which it finds no connection or meaning, many students find their education meaningless.

A computer, like an instructor, can supply knowledge and information, but it cannot help students make connections between their lives and that knowledge and information. It is the major task of the instructor to help students make connections so that the purpose of learning is immediately understandable. If the teachers don't make the difference, they are in danger of extinction.

The process of what is now called "brain-based learning" calls for making connections. Psychologists, philosophers, and educators from William James to John Dewey to Jerome Bruner – all the way to Howard Gardner and Robert Sternberg – have made the case for

5 Harwell and Blank.

6 Willard Daggett, "Rigor and Relevance from Concept to Reality," International Center for Leadership in Education, 2008.

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making connections in education. In the past few decades, neuroscientists have shown the need for making connections in the teaching and learning process.

In 1989, the Secretary of Labor’s Commission on Achieving Necessary Skills (SCANS) was formed under the leadership of Secretary of Labor Elizabeth Dole and Assistant Secretary Robert Jones. Representatives from business, industry, labor, government, and education labored mightily to shed light on the question, “What does work require of schools?” The Commission staff studied the cognitive science research literature related to the importance of **contextual teaching**. They also interviewed a number of cognitive scientists and more than 500 private and public employers to discover what they expected of educational institutions and what kind of education and training they thought would be required to meet future needs. As a result the Commission formed the following mission statement:

We believe that these skills (SCANS-recommended skills and competencies) are best learned in context and especially in the context of realistic workplace problems. Thus the teaching of functional skills will require the most radical change in educational practices since the beginning of this century. (SCANS 1991)

The contextual approach to teaching and learning is not a new pedagogical method. There have always been highly effective teachers who motivate their students to achieve academically by connecting content to context. One of the first educational tools for teaching mathematics contextually was called *Applied Mathematics*, developed in 1986-1988 by a consortium of over 40 state education agencies led by CORD.

The first large-scale test of *Applied Mathematics* was administered during the 1992-1993 school year – 326 students completing *Applied Mathematics* at 20 schools in 13 states were tested in algebra I concepts and compared with 843 traditional algebra I completers. Results showed no significant difference in the scores of the two groups, despite the fact that the Applied Mathematics students had significantly lower entry-level skills.⁷ This means that the applied group improved at a higher rate.

⁷ Candace Todd, “A Report on the Attainment of Algebra I Skills by Completers of *Applied Mathematics* 1 and 2”, CORD, July 1993.

During the same school year, four researchers from the University of Georgia studied the *Applied Mathematics* curriculum as it relates to college preparatory credit. One of their findings dealt with the motivational impact of teaching contextually. Teachers attributed the very high rate of success of students who had not previously been successful in mathematics, to the positive attitudes students had toward the activity-oriented approach to teaching.⁸

Multiple intelligences

As stated earlier, there is nothing new about contextual learning. There have always been teachers who intuitively understood how to teach concepts so that all learners could grasp them—through example, illustration, and hands-on application. But even these naturally effective teachers can benefit from understanding the findings of cognitive research and from learning how to put these findings to use. The results of research explain the success of contextual teaching and learning approaches in the classroom.

Howard Gardner, professor of education and psychology at Harvard University, challenged traditional thinking by questioning whether intelligence is a single, measurable capacity. Gardner posited instead that the human capacity for learning is much broader than traditional measurements of intelligence would indicate. Gardner argued for as many as seven forms of intelligence: linguistic, logical/mathematical, musical, spatial, kinesthetic, interpersonal, and intrapersonal. He based his theory on his observation of the wide range of capabilities of adolescents.⁹ Further investigation led Gardner to add two additional forms of intelligence – naturalistic and existential. In 2008, on the 25th anniversary of the publication of his original report on multiple intelligences, Gardner reflected on its impact on education. In 1983 he did not expect that his ideas about multiple intelligences in the field of psychology would be picked up by educators

8 William D. McKillip, Edward J. David, Thomas R. Koballa Jr., and J. Steve Oliver, “A study of *Applied Mathematics* and *Principles of Technology* Relative to the College Preparatory Curriculum Final Report,” University of Georgia, July 1993.

9 Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: Basic Books, 1983).

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all over the globe. He now believes that any serious application of multiple intelligences ideas should entail at least two components:

1. An attempt to individuate education as much as possible. The advent of personal computers should make this goal much easier to attain.
2. A commitment to convey important ideas and concepts in a number of different formats ¹⁰

In his discussion of the variety of learning styles, learning theorist David Kolb observes that learners tend to perceive information either abstractly (by conceptualizing/thinking) or concretely (by experiencing/feeling) and then process that information either actively (by experimenting/doing) or reflectively (by observing/watching).¹¹ Kolb's construction, like Gardner's, clearly indicated that most students do not fit neatly into one category or the other. All students can learn by and benefit from all four experiences (thinking, feeling, doing, and watching). Most students will show a preference for one or two particular kinds of learning, and this preference will indicate the individual's primary learning style(s).

The emphasis for contextual learning is to use this process for effective learning to reach the strengths of all students. However, as Kolb's studies indicate, most students have a tendency to learn in a concrete manner (with an emphasis on feeling and doing), while the school system tends to teach in an abstract manner (with an emphasis on thinking and watching). This may not be the best allocation of public money.

Striving for connectedness

Despite the individual differences in learning styles and intelligences, all learners strive for connectedness. Learning is cumulative. Isolated bits of information normally are not processed and retained by the mind for meaningful use unless connections are made and points of

10 Howard Gardner, "The 25th anniversary of the publication of Howard Gardner's *Frames of Mind: The Theory of Multiple Intelligences*. April 2008. (<http://pzweb.harvard.edu/pis/MIat25.pdf>; accessed March 2012).

11 David A. Kolb, *Experiential Learning: Experience As the Source of Learning and Development* (New Jersey: Prentice-Hall, 1984).

reference or relationships are established between what is known and what is not known.

Learning theorists Renate Caine and Geoffrey Caine explain this “connectedness” theory by pointing out that all knowledge is “embedded” in other knowledge.¹² Academic “subjects” such as English, math, and chemistry are at best artificial distinctions within a single body of knowledge. Allowing these subjects to overlap and integrating them into a single curriculum can therefore provide a better, more connected understanding.

In addition to making connections between different school subjects, teachers can enhance the learning process by engaging students in hands-on activities and concrete experiences as other ways of reinforcing the usefulness of the knowledge. Lab activities, experiments, and projects that require students to be actively involved in the community usually stimulate interest and motivation to learn. Integrating work-based learning with school subjects is another effective way to ground learning in actual experience.

Constructivism

John Dewey and Jean Piaget, among others who studied how students learn, contributed to the modern view of learning called *constructivism*. Education researchers, psychologists, and cognitive scientists have published hundreds, perhaps thousands, of research articles about various aspects of constructivism. It is a view of learning that people construct new knowledge and understandings based on what they already know and believe. Teaching strategies based on constructivism include exploration and active learning. These strategies include using hands-on activities, encouraging students to think and explain their reasoning instead of merely memorizing and reciting facts, and helping students to see the connections among themes and concepts rather than presenting them in isolation.¹³

12 Renate Nummela Caine and Geoffrey Caine, *Making Connections: Teaching and the Human Brain* (Alexandria, Virginia: Association for Supervision and Curriculum Development, 1991).

13 Michael L. Crawford, *Teaching Contextually: Research, Rationale, and Techniques for Improving Student Motivation and Achievement in Mathematics and Science* (CORD, 2001).

Additional research

If educators really want all students to master rigorous academic standards, they must use instructional strategies that have been empirically documented to be effective. Dolores Perin conducted a literature review on the “evidence of contextualization.”¹⁴ The purpose of the review was to consider whether low-skilled students can learn more effectively and advance to college-level programs more readily through contextualization of basic skills instruction. The presence of large numbers of low-skilled students in colleges, especially community colleges, along with low rates of retention and progress in course work and recent findings that traditionally low graduation rates are not increasing suggests that the method of instruction of academically underprepared college students needs to be reformed. An analysis of the 27 studies found in the review suggests that contextualization has the potential to promote short-term academic achievement and longer-term college advancement of low-skilled students. These strategies are familiar to effective teachers.

What Are Some Teaching Strategies That Work?

REACT—A better way

CORD developed an acronym, REACT, for describing the five elements of contextual teaching. Through years of teaching, supervising and developing curricula, CORD has observed many outstanding teachers creating exceptional learning environments. These teachers used five teaching methodologies at least some of the time. CORD called them *contextual teaching strategies*: relating, experiencing, applying, cooperating, and transferring. These elements focus on teaching and learning in context. REACT is an easily remembered acronym that represents methods used by the best teachers and also methods supported by research on how people learn best.

- Relating (Learning in the context of life experiences)
- Experiencing (Learning in the context of exploration, discovery, and invention)

14 Dolores Perin, *Facilitating Student Learning Through Contextualization* (Community College Research Center: Teachers College, Columbia University, 2011).

- Applying (Learning in the context of how the knowledge and information can be used)
- Cooperating (Learning in the context of sharing, responding, and communicating with other learners)
- Transferring (Using knowledge in a new context or novel situation – one that has not been addressed in class)

Relating

Relating is *learning in the context of one's life experiences or preexisting knowledge*. Given that learning is the challenging process of going from what is known to what is not known by presenting problems within a situation or context known by the students, teachers help students when linking a new concept (to be learned) to something completely familiar to them (previous knowledge), thus connecting what students already know to the new information. When the link is successful, students gain almost instant insight. Caine and Caine call this reaction “felt meaning” because of the “aha!” sensation that often accompanies the insight.¹⁵ Felt meaning can be momentous, as when a student first sees the solution to a problem that he or she has spent significant time and effort in solving. Felt meaning can also be subtle, as when insight leads to a milder reaction, such as, “Oh, that makes sense.”

Excellent contextual teachers plan carefully for learning situations in which students can experience felt meaning. Careful planning is needed because often students do not automatically connect new information to the familiar. Research shows that, although students may bring memories or prior knowledge that is relevant to a new learning situation, they can fail to recognize its relevance. When teachers both provide environments in which students activate memories or prior knowledge *and* recognize the relevance of the memories or knowledge, they are using relating.

Experiencing

Relating connects new information to life experiences or prior knowledge that students bring with them to the classroom. But this approach is not possible if students do not have relevant experience

¹⁵ Caine and Caine.

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or prior knowledge. Teachers can overcome this obstacle and help students construct new knowledge with orchestrated, hands-on experiences that take place inside the classroom. This strategy is called *experiencing*. It is *learning by doing*— *through exploration, discovery, and invention*. In-class hands-on experiences can include the use of manipulatives, problem-solving activities, and laboratories. The process of collecting data and getting information needed to solve a certain problem gives students a sense of ownership and direction that help motivation, which is the key to learning.

Applying

We define the *applying* strategy as *learning by putting the concepts to use*. Obviously, students apply concepts when they are engaged in hands-on problem-solving activities and projects like those described above. Teachers also can motivate a need for understanding the concepts by assigning *realistic* and *relevant* exercises. These exercises are “word problems” like those found in all textbooks. But they have two major differences: They pose very realistic situations, and they demonstrate the utility of academic concepts in some area of a person’s life. Both are important for application problems to be motivational.

Cooperating

Many problem-solving exercises, especially when they involve realistic situations, are complex. Students working individually sometimes cannot make significant progress in a class period on these problems. They can become frustrated unless the teacher provides step-by-step guidance. On the other hand, students working in small groups can often handle these complex problems with little outside help. Teachers using student-led groups to complete exercises or hands-on activities are using the strategy of *cooperating—learning in the context of sharing, responding, and communicating with other learners*.

Working with their peers in small groups, most students feel less self-conscious and can ask questions without feeling embarrassed. They also will more readily explain their understanding of concepts to others or recommend problem-solving approaches for the group. By listening to others in the group, students reevaluate and reformulate their own sense of understanding. They learn to value the opinions of others because sometimes a different strategy proves to be a

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better approach to the problem. When a group succeeds in reaching a common goal, student members of the group experience higher self-confidence and motivation than when students work alone.

Transferring

In a traditional classroom, the teacher’s primary role is to convey facts and procedures. The students’ roles are to memorize the facts and practice the procedures by working skill drill exercises and, sometimes, word problems. Students who can recall and repeat the appropriate facts and procedures score well on the end-of-unit or end-of-semester test. By contrast, in a contextual classroom, the teacher’s role is expanded to include creating a variety of learning experiences with a focus on understanding rather than memorization. Contextual teachers use the strategies discussed above (relating, experiencing, applying, and cooperating) and they assign a wide variety of tasks to facilitate learning for understanding. In addition to skill drill and word problems, they assign experiential, hands-on activities and realistic problems through which students gain intuitive initial understanding and then deepen their understanding of concepts.

Students who learn and understand can also learn to transfer knowledge. *Transferring* is a teaching strategy that we define as *using knowledge in a new context or novel situation—one that has not been addressed in class*.

Research shows that, when teachers design tasks for novelty and variety, student interest, motivation, engagement, and mastery of mathematics goals can increase. Excellent teachers seem to have a natural ability to introduce novel ideas that motivate students intrinsically by invoking curiosity or emotions.

Promising Practices in Contextual Learning

There are several classroom teaching strategies that can be identified as including some or all of the REACT elements. Here are a few:¹⁶

Problem-Based Learning

With problem-based learning, the educational experience is organized around problems and themes rather than subject-matter disciplines.

16 Sandra H. Harwell, and William E. Blank, *Promising Practices for Contextual Learning* (CCI Publishing, Inc., 2001).

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Problem-based learning is a strategy many teachers use to create a student-centered learning environment in the classroom. Teachers create or encourage students to identify an ill-defined problem or issue that is grounded in the students' experiences. The classroom teacher then serves as a guide as the students work through solving the problem through a discovery-based, research-rich learning process. When students solve problems rather than learning passively, they take ownership of the knowledge and skills they are gaining. They develop an intrinsic motivation based on the satisfaction of accomplishment.

Project-Based Learning

Project-based learning has become a time-proven approach for providing rigorous, relevant, contextual, learning in a manner consistent with how learning takes place beyond the walls of the school and is also compatible with how the brain learns more efficiently. In project-based learning, individual students, small groups, or the entire class focus on creating a useful product or service or similar tangible outcome that is of authentic value to someone outside the classroom. It is similar to problem-based learning in terms of the constructivist process in which students engage, however, project-based learning goes an important step beyond problem-based learning: creation of a tangible outcome. Ideally, projects should closely resemble the kinds of accomplishments performed by adults in the "real world" (example: a semester-long project).

Service Learning

Many educators believe that young people should be connected with their community and their own humanity through service. The added notion of linking service with learning has made the concept of service even more attractive as a vehicle for better connecting what happens in school with what happens in the real world. Service learning is a form of experiential education and is a powerful vehicle for achieving the goals of character education. Learning is facilitated when it is personally relevant and contextual and when the learners can see application in their own lives of what they are being asked to learn. Service learning usually takes the form of project-based learning with the project being something that serves the good of some element of

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the community (e.g. working with a non-profit or local government agency).

Cooperative Learning

Cooperative learning involves deliberately structuring working groups to replicate the population in the classroom. The heterogeneous nature of a truly cooperative group may be one of the most significant factors. Students learn from each other, building understanding and tolerance of differences and at the same time learning to value the diversity. The group functions as an interdependent unit to solve a problem, reach a goal, or create a project. The cooperative learning teacher structures activities in such a way as to create a need for students to depend on each other. At the same time, the students are reminded that they have an individual responsibility to contribute to the group outcome. These cooperative methods have been used successfully in industry settings all over the world.

Self-Directed Learning

Learning how to become independent, self-directed learners is perhaps the most important skill that students can acquire. Such skills will prepare them well for the demands of lifelong learning they will face as adults. In the world beyond the school classroom, adults often engage in self-initiated, self-directed, context-rich learning aimed at locating needed information or mastering skills they want to learn. People engaged in self-directed or independent learning are typically learning something they want to learn, in a manner in which they choose to learn. Self-directed learning may sometimes be known as *independent study*, *distance learning*, *online courses*, or could take the form of a competitive project.

Work-Based Learning

Work-based learning is a critical component of a system capable of preparing students for life. Work-based learning is knowledge, skills, and attitudes taught in the context of work or life settings. It can take place in a home, community, or workplace or in a work simulation like a school lab. Without work-based learning opportunities, education is almost like trying to teach a child to ride a bicycle with no

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opportunity to ride an actual bicycle. Work-based learning connects the skill or knowledge with the real application.

School-Based Enterprise

A school-based enterprise is any activity through which students produce goods or services for sale to or use by people other than themselves. It is important to realize that participating in the establishment and operation of a school-related business is preparation for both careers and postsecondary education. Some examples of school-based enterprises are sales of refreshments, school supplies, or other merchandise like furniture or recycled materials. Also, a student-run bank is another example. Students learn creation of a business plan, marketing, accounting, manufacturing, distribution, etc.

Integrating Academic and Career and Technical Education

An often overlooked resource for academic teachers who might be searching for ways to better connect what they teach in the classrooms with the real world is the career and technical education instructors located in their own schools. In the absence of integration, academics is likely to be more focused on covering vast numbers of facts and concepts without much regard to context or application. On the other hand, career and technical education may be more focused on equipping graduates with a fairly narrow range of skills needed for immediate employment in a very narrow range of jobs. Integration is an attempt to address the major criticisms of both areas of study. Forming teams with other instructors, workplace representatives, and experts on specific subjects can create a well-rounded instructional base from which students can apply what they are learning to concrete experience.¹⁷

Smaller learning communities

The term “smaller learning communities” has been used with schools which have a small population and with small groupings of students and teachers within a larger school. These small groupings have been referred to as an academy, a pod, a building, a team, or

¹⁷ Stephanie Kalchik and Kathleen Marie Oertle, *The Theory and Application of Contextualized Teaching and Learning in Relation to Programs of Study and Career Pathways* (Urbana-Champaign, IL: Office of Community College Research and Leadership in “Transition Highlights,” September 2010).

a cohort. Students normally stay with an interdisciplinary team of teachers. Several personalized strategies used in the smaller settings have resulted in improved behavior and attendance while students perform as well or better than large school students. The U.S. Department of Education awarded Smaller Learning Communities grants from fiscal year 2000 through 2009 to encourage the development of, and research on, the practice.

Career Academies

A career academy is a type of smaller learning community. The use of career academies is a very promising practice used by a growing number of high schools. However, career academies are more than just a classroom teaching strategy. Career academies are a way to restructure schools. They typically operate as schools within schools with each academy focused on a career theme in which there are good employment opportunities and sufficient businesses in the area that can provide advice to the academy as well as job shadowing and internships to the students. An example of the kind of learning experience typically found in a career academy is project-based learning. One of the reasons academy students find their learning experiences so rewarding and relevant is that extensive use is made of real-world connected experiences. Two organizations which provide direction and services to career academies are the National Career Academy Coalition (www.ncacinc.com) and the National Academy Foundation (www.naf.org). NAF reports that more than 90% of NAF students graduated from high school—compared to 50% of non-academy students in the urban areas where the NAF academies are located.

In a report on career academies funded by several independent foundations, MDRC (a nonprofit, nonpartisan research organization) studied nine urban high schools over a 15-year period. The study followed randomly assigned students from entering high school until eight years after their scheduled graduation. One of the most significant findings is that career academy graduates had 11 percent more sustained earnings than individuals in the control group, and these impacts on earnings are concentrated among young men and students at risk of academic failure.¹⁸

18 James J. Kemple. *Career Academies: Long-Term Impacts on labor Market Outcomes, Educational Attainment, and Transitions to Adulthood*. MDRC, 2008.

How Can Teacher Effectiveness Be Improved?

A fundamental paradigm shift

Most teachers are not equipped to use contextual teaching methodologies effectively. Doing so calls for a fundamental paradigm shift that most are unable to make without a well-crafted professional development program—not just an isolated activity now and then but a strategically sustained professional development process design to help teachers master contextual teaching. The paradigm shift is so deep that it cannot be carried out without this long term process. Experience shows that it is very hard to depart from the deep-rooted culture of teaching which follows traditional methods of lecture and memorization.

Some characteristics of contextual learning goals

Before teachers can begin to make a paradigm shift of this magnitude they must understand the goals/purposes of contextual learning. Here are some essential characteristics of contextual learning goals:

Contextual learning goals are application oriented.

Embedded deeply within the philosophy of contextual learning is the idea that every student must have the opportunity not only to acquire knowledge, but also to develop the competencies required to function effectively in his or her real-life roles. Thus, there is a profound shift in emphasis from what is to be taught to what is to be learned. This is probably the most basic and powerful characteristic of contextual learning goals: They are application oriented.

Contextual learning goals are learner centered.

Are our educational institutions addressing the highest-priority needs of the students to become problem solvers, critical thinkers, and life-long learners? Contextual learning offers the ability to make connections that give the student a touchstone of reality upon which to build solid and meaningful learning.

Contextual learning goals are time-flexible.

In contextual learning, how long it takes a student to master a given competency is not as important as the mastery itself. As a result,

contextual learning goals provide for considerable flexibility when it comes to scheduling. Less emphasis is placed upon completing a specified unit of study in a specified time period. Students are allowed to move and recycle through the instructional process easily, and time is used flexibly. Not all learners are nine-week or eighteen-week learners; in fact, rate of learning is one key difference among learners.

Contextual learning goals are purpose centered and “up front.”

A fourth characteristic of contextual learning goals is that clear statements of purpose must precede expected result statements and must be placed “up front” as guides for both instructors and learners. There should be no surprises in the instructional or evaluation process. This aspect of contextual learning goals helps to correct a common problem encountered with stimulus and response behavioral objectives – their narrow focus. Behavioral objectives tend to keep teachers and learners so focused on the minuscule that the connection is never made to the larger purposes of a lesson or the even larger purposes of the educational organization. Today’s students’ needs are not met by only behavioral objectives. Contextual learning insists that no matter what is being taught, students should always know how that subject matter fits into larger purposes.

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Improving support systems

Whatever specific policies they influence, contextual learning goals are the beginning point in making *meaning* the focal point of education at all levels. As education leaders begin to bring a greater degree of congruence between purposeful goals, anticipated results, and the teaching-learning process, the work of creating a continuous and coherent learning experience for students becomes easier. At the same time, students are empowered to develop their competencies to higher levels and become more capable of coping with complexity and change. But for all this to happen, leaders, teachers, and policy makers alike must keep a clear and constant vision of what education is supposed to accomplish in the long run – to serve the society of which it is a part.

Successful schools can be built, but they cannot be sustained simply through the leadership of just one individual, or even a few individuals. To sustain successful schools’ reform you need to create

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leadership teams that include individuals from multiple levels of the organization, including central administration, building-level administrators, classroom teachers, parents, students, and community leaders. They must work as a team together to encourage each other as they encounter people or groups that fight change or as unforeseen bumps in the road add new challenges.¹⁹

Implementing contextual learning in the classroom does not require just new hands-on equipment. It requires not only new teaching techniques but a new definition of school and teaching. For contextual learning to have its maximum effect on students, teachers must be empowered to effectively implement contextual teaching methodologies. This empowerment can come only through professional development.

Teacher professional development: It's not an event, it's a process

Too little attention has been paid to what actually goes on in the classroom. As long as teachers continue to teach the way teachers have taught for years, we cannot expect students to change what they do. The problem has not been a lack of professional development opportunities, but is that the quality of programs has been inconsistent, not strategically thought out, and there has been no consensus on what constitutes quality. What then are the characteristics of high-quality effective teacher professional development and the factors that contribute to its success?²⁰

Context (or setting)

- Supports professional development and the changes it is intended to bring about
- Is characterized by a shared sense of need for change
- Its teaching professionals agree on answers to basic questions regarding the nature of learning and the teacher's role in the classroom
- Its teaching professionals consider learning a communal activity

19 Daggett.

20 Sandra H. Harwell, *Teacher Professional Development: It's Not an Event, It's a Process* (Center for Occupational Research and Development, 2003).

Content

- Deepens teachers' subject matter knowledge
- Sharpens classroom skills
- Is up to date with respect to both subject matter and education in general
- Contributes new knowledge to the profession
- Increases the ability to monitor student work
- Addresses identified gaps in student achievement
- Centers on subject matter, pedagogical weaknesses within the organization, measurement of student outcomes, and inquiry regarding locally relevant professional questions
- Focuses on (and is delivered using) proven instructional strategies

Process

- Is research based
- Is based on sound educational practice such as contextual teaching
- Supports interaction among master teachers
- Takes place over extended periods of time
- Provides opportunities for teachers to try new behaviors in safe environments and receive feedback from peers

While it is important for the teacher to be in the classroom, it is just as important for the teacher to be given the tools necessary to unlearn ineffective teaching methods and replace them with effective teaching methods. One way to accomplish this without huge commitments of time and money is online professional development programs that combine face-to-face and online interaction. Following an initial face-to-face session, participants interface with one another and with the course facilitator asynchronously via the Internet, which means that they can work almost entirely at home and at their convenience. Online courses can span several weeks, giving participants ample time to practice what they are learning and reflect on its effectiveness.

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Also, orientation for students and parents about this new style of teaching and learning is essential to gaining acceptance and leads to better adjustment of the student-teacher relationship in the classroom. Teaching is both an art and a science that should be practiced with a certain amount of empathy so that students do not become frustrated with new expectations for learning.

The role of business and industry

Chapter 8 reviewed the benefits and requirements of education and business/industry partnerships. The role of business and industry in teaching and learning is paramount. Business and industry partnerships with education provide most of the context for learning – and this is done in several ways.

It's obvious that a benefit to students is that there may be the opportunity for employment after graduation or program completion, but **during** the education process there are several ways in which employers provide context and motivation to teachers and learners:

- Employers work collaboratively with faculty to improve or develop curriculum when needed as industry trends change. This includes the review of materials, equipment, and textbooks before purchases are made.
- Employers provide work-based learning opportunities such as field trips, job shadowing, cooperative education, internships, as well as in-school exhibits and presentations.
- Employers provide professional development including allowing faculty to have work-site experiences.
- Employers sometimes provide financial support such as scholarships and equipment donations which provide opportunities for continued learning that would not otherwise exist.

When you read or hear about outstanding career pathways programs or hear about schools that have excellent graduation rates, you can bet that there are well-developed business/industry relationships that drive contextual teaching and learning. This is true not only in the U.S, but in other countries as well. Chapter 3 mentioned some of the work-based learning that takes place in other countries, and CORD has achieved some outstanding results in Latin American countries such as the Dominican Republic and Brazil. In these countries,

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employers have taken the lead in improving education by becoming more involved with teachers and students. After intensive teacher professional development, students in those countries are showing increased passing and graduation rates and finding better employment due to the investment of employers.

Working toward contextualization

Most teachers have natural tendencies to teach traditionally—the way they were taught, the way their teachers were taught, and so on. Despite the dramatic transformation throughout our society over the last half-century, teaching methods in mathematics and science classes have remained unchanged for many. A growing number of teachers have begun to capitalize on the many dimensions of the learning process. Those teachers are motivated to devote the additional time and effort to see their students enjoy learning.

Where Is It Working?

There are many good examples of where contextual teaching and learning are being practiced. Below are just a few examples.

Elementary and Middle School

- An excellent example of a **contextual teaching** program is the *If I Had a Hammer* program founded by master carpenter, Perry Wilson. He created a curriculum which teaches math (e.g. fractions and geometry) to third through eighth grade students using the context of construction of a scale model house. The *Hammer* program has reached over 500,000 young students. Today, college students are being trained to deliver the lessons.
- At B. Michael Caudill Middle School, in Richmond, Kentucky, a new cohort of 7th graders enters a STEM-enriched career pathway each year – the *Applied Engineering Technology Education Career Pathway*. Science, math, and engineering technology education teachers work together to create and teach an **integrated curriculum**. One 7th grade student asked math teacher, Ashlie Griggs, “When will I ever use this?” Because of the professional development she was provided and the integrated lesson planning, Ms. Griggs was able to reply, “Next week in Mr. Marionneaux’s

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engineering technology class,” and then proceeded to tell the class several other ways that the study of X, Y, and Z coordinates would come in handy in the world of engineering and manufacturing. Teacher, Steve Marionneaux was able to reinforce the potential contexts for the same math concepts. Plans are for this pathway to be coordinated and continued through high school and college.

High School

- As mentioned earlier, the **career academy structure** is being used by more and more high schools as a means to consistently deliver contextual teaching. An excellent example of a high school with career academies is the A. J. Moore Academy in the Waco (TX) Independent School District. A. J. Moore is a magnet school which offers students a choice of seven academies (engineering; environmental technology; finance; health professions; hospitality and tourism; information technology; and public service administration). Several of the academies have been recognized as top programs in the country by the National Academy Foundation and the entire school has been recognized as a model school by the International Center for Leadership in Education. A. J. Moore reports a 99.3% graduation rate – more than 18 percentage points above the other non-academy high schools in the district.
- Combining **project-based learning** with **service learning** is a winning combination for students in Scot McAtee’s Interactive Media class at Twin Lakes High School in Monticello, Indiana. His students thought that video creation was for making funny stuff for YouTube and for ways to embarrass others. That is, until he got them involved in doing projects that had a positive impact on their community. Since then, Mr. McAtee’s students have won awards for their media projects and have learned they can make their community a better place using the same “toys” they had been playing with all along.
- The North Carolina Department of Public Instruction studied the success of a pilot program at a single school and then expanded it to 12 more schools across the state. The pilot used a two-teacher approach with combined lesson plans, discipline, parent

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contact, and decision making – the ultimate **integration pilot**. English I was combined with a computer technology course which included Microsoft Word, PowerPoint, and Publisher software. Curt Miller, DPI’s Business, Finance and Information Technology Education Consultant, reported that after a three-year study, the combined class structure dramatically increased the success of the students in English and computer technology. Of particular note was that the students had “limited reading proficiency” when beginning the course, but had English end-of-course scores that exceeded the scores of non-honors students in other non-integrated classes by 21 percentage points the first year and by 16 percentage points the second year. Innovative ideas gained from the pilot are shared with other teachers throughout the state in an online Moodle Professional Learning Community.

- The Bridgeport (CT) Regional Aquaculture Science and Technology Education Center (BRASTE^C) accepts student applications from seven area school districts. Students attend for 2¼ hours per day and receive science and technology education credits toward high school graduation requirements. BRASTE^C’s **integrated curriculum** is centered around existing and emerging careers in global aquaculture. Students work on contextual projects such as boat construction, designing a prototype aquatic farm system, or operating a **school-based enterprise** such as a public seafood market that features fish grown in the school’s hatchery. The school has a reputation for its highly prepared and motivated students entering either college or industry. Over 90% of the graduating students are accepted by colleges and universities, including the maritime academies in the Northeast.
- The Western Wisconsin STEM Consortia received a Math-Science Partnership Grant from the Wisconsin Department of Public Instruction in 2009 to implement its project, SySTEMically Improving Student Academic Achievement in Mathematics and Science. The overall project goal was to improve student academic achievement in mathematics and science by providing three years’ of intensive professional development (100 hours/year) in mathematics and science content and pedagogy for sixty (60) teachers from nine K-12 school districts. Teachers developed STEM **integrated curriculum projects** (<http://www.uwstout>).

edu/wwsc/index.cfm) that were modeled after CORD's STEM Transitions Project (www.stemtransitions.org). The projects addressed math and science topics in the following three clusters: Agriculture, Food, and Natural Resources; Manufacturing; and Transportation, Distribution, and Logistics. Teacher evaluation data revealed statistically significant gains (.05 level) in both science and mathematics content knowledge and pedagogy in years one and two of the grant. Additionally, an analysis of student evaluation data indicates positive effects on student achievement based upon the professional development opportunity of the teachers.

- The Loyola Polytechnic Institute (*Instituto Politécnico Loyola*, IPL in Spanish) is a public school in the Dominican Republic. With the support from the Business Initiative for Technical Education (Iniciativa Empresarial para la Educación Técnica, IEET in Spanish), this school embarked in a career pathways program in 2007. During the first four-year phase, **intensive teacher professional development** was done (more than 10,000 man-hours) to ensure the paradigm shift would become a habit in the teachers and to avoid teachers "inertia" (that phenomenon of coming back to traditional and more familiar ways of teaching). The experience of the IPL (through the IEET) shows several things, among which the following can be highlighted: (a) IPL graduates had a 85% passing rate of national tests compared to a 60% rate for the rest of the country; (b) the learning atmosphere in the school improved dramatically (more proactive and engaged students); (c) the learning curve for students in an industry setting has been dramatically reduced (from 18 months to 3 months in one company); (d) a high proportion (more than 50%) of students leave high school with a job offer; and (e) other social and educational organizations are looking to apply this business-directed model. In addition to the expansion of the project from 1 to 13 schools (in 2011), there are two main business cases that can be mentioned. In 2011, IMCA (the Caterpillar dealer in the Dominican Republic and Jamaica) was recognized by the American Chamber of Commerce in the Dominican Republic for having created the IEET (Business Initiative for Technical Education) which made a huge impact on education since its inception in

2007. Barna Business School, in the Dominican Republic (<http://www.barna.edu.do>), has included in its MBA programs the IMCA case study as one exemplary example of business-education partnership and commitment.

Postsecondary

- Mitchell Community College, in Statesville, North Carolina, is a strong proponent of **contextual teaching** methods, which is evidenced by the creation of a unique staff position – Director of Contextual Teaching and Learning. Although some instructors had been using contextual teaching and learning for many years, more intentional efforts began in the 2008-09 academic year. As part of Mitchell’s Quality Enhancement Plan (QEP), a developmental math course was contextualized by use of the “recipe project.” Students learned ratios and fractions through the real-world use of food portions. Almost 90% demonstrated proficiency in this project. Since that time the entire curricula has been contextualized, as in the following course examples: *humanities* (projects focused in “Race in America”); *business law* (learning history and judicial procedures); *advanced solid modeling* (using software for reverse engineering to create duplicates); and *statistics* (crime scene investigation project to learn correlation and regression). Students and faculty at Mitchell report more student motivation and learning when contextual teaching and learning is practiced.
- Houston Community College’s Quality Enhancement Plan is entitled INSPIRE: INnovative Science Program Initiatives to Reform Education. At the heart of HCC INSPIRE lies the desire to facilitate changes in pedagogy from the traditional “sage on the stage” format to include a more active & collaborative, student-centered format. The goal will be to improve student learning and engagement, beginning with the sciences. For each of three targeted science courses, faculty teams will compile one comprehensive module that will address all of the core concepts of an entire textbook chapter. Modules will be framed in the **context of solving a central real-world problem**, a challenge or research question, some of which will require active and collaborative teamwork. A welcome ripple effect of the project will be the fostering of new

levels of communication and collaboration among full-time and part-time faculty within and across disciplines.

Adult Education

- Blackhawk Technical College, in Janesville, Wisconsin, created a *College Readiness Bridge Program* in response to the closure of a General Motors production facility. The closure resulted in the loss of 5,000 local jobs between the plant and its suppliers, with 1,500 workers coming to BTC. The *Bridge* program was specifically designed to meet the unique needs of individuals who have been away from formal education for an extended period and tested below college level. The program provides **integrated courses** combining technical coursework with adult basic skills education, pairing a technical program instructor and basic skills instructor to team-teach the courses. Several hundred were placed into instruction in health care, welding, or business over two semesters, with completion rates of 60 percent. Certificate program graduates may choose to enter employment or pursue a technical or associate degree.
- Indian River State College in Fort Pierce, Florida, offers a wide variety of **contextual programs in Adult Education**. The Burlington English Career Extensions program combines content and context for various career fields by offering the linguistic bridge necessary for ESOL students to move seamlessly from general ESOL courses into their chosen career path. Learners can acquire linguistic knowledge online; applying it to contextualized texts and activities, and then extend their learning in face-to-face activities which help them to further assimilate the language learned. The Career Extensions program enables students to work on two processes in a parallel manner. At one level they learn the academic English needed for their studies, while at the same time, preparing for intensive English studies in their chosen careers. By empowering these adult learners with the language needed for technical and soft skills needed, they can become productive members of the workforce much sooner, thus filling the available jobs in the communities in which they live.

Are We Up to the Challenge?

Over the last two decades, the federal government and states have put more emphasis on contextual teaching and learning through programs like Tech Prep, career clusters, career pathways and programs of study. The Carl D. Perkins Career and Technical Education Improvement Act of 2006 includes a requirement that funds be used for professional development which, among other things, provides opportunities for academic and career and technical education teachers to jointly develop and implement curricula and pedagogical strategies including applied (contextual) learning. In spite of the emphasis, confusion regarding how to do this and what it will look like restricts development of curricula and strategies. Helping academic and career technical education teachers and instructors to work together to make connections between rigorous academics and realistic application of academic content is a goal we can and should reach if our students are to compete in a global economy.

The need to help students make connections between content and context has been the focus throughout this chapter. Isolated content taught without context is not the way people learn. All educators need to reflect on how effective current teaching strategies are in raising achievement levels of all students. While spots of excellence in contextual teaching and learning exist throughout the country, the enthusiasm and excitement for teaching in a meaningful way must be shared.

We know that the best contextual textbook, along with excellent equipment and a state of the art facility will not give the expected results if teachers are not well prepared. That is why teacher professional development is the best investment for schools and society. An effective professional development process gives meaning and leverage to all other investments in education.

There may be many answers to the question “Why do I have to learn this?” However, the best answers are the ones that provide meaning and motivation to each learner.