Excerpted from

Differentiating Instruction with Technology in K–5 Classrooms

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Differentiating Instruction with Technology in K–5 Classrooms helps today's educators understand how to immediately use technology as a tool to differentiate instruction. The authors provide a variety of practical instructional strategies to accommodate a broad range of learning styles, abilities, and curriculum content. Creative, ready-to-use lessons mapped to curriculum content standards, activities, and templates allow teachers to kick-start their use of technology in differentiating instruction.

This excerpt provides an overview of differentiated instruction, and discusses the basic principles

CHAPTER 1

Overview *and* Principles *of* Differentiated Instruction

NCLB, IEP, GLCE, MI, 6 + 1 Traits—are any of these acronyms a part of your everyday language? As teachers, we have our own jargon, which is often based on current educational trends and philosophies.

Sometimes it can seem overwhelming to keep abreast of all the latest developments and buzzwords in our profession. While many of the changes and advances become an important part of our curricula and repertoire, others fall by the wayside because we learn they aren't as effective as advertised.

The waning popularity of particular approaches or tactics doesn't necessarily mean that their methodologies are inherently flawed but that our teaching practices are keenly shaped by such external factors as cultural shifts, changes in the family dynamic, and technology improvements. So as the "business" of education undergoes changes, we, too, must make modifications to reach students of different backgrounds and levels of ability.

Yet another acronym you're undoubtedly familiar with is DI, or differentiated instruction. Perhaps unlike some of the acronyms listed above that represent various educational theories or practices, DI has the potential to play a vital and sustained role in the classrooms of the future. While older movements and strategies may fade and new ones develop, the essential premise of DI gives promise to its being long-lasting. It offers a unique flexibility to withstand change over a significant period of time. Why is this?

The core of DI is a broad framework that offers multiple approaches to meeting learners' needs. Our classrooms today are more diverse than ever, with a wide range of interests, levels of readiness, and learning styles. In addition to this breadth of academic diversity, we encounter a challenging array of cultural and familial differences that strongly influence our students' social and learning personalities. As teachers, we're faced with meeting the unique needs of each and every student. We're also charged with ensuring high levels of student achievement across the board.

As opposed to some educational theories and methods of the past, DI actually embraces the recognition of cultural, familial, and academic differences among students. Teachers who practice DI modify their instruction to address that diversity and to meet curricular objectives. At the same time, in the DI classroom, educators don't bear *all* the responsibility for student learning and achievement. Students have responsibilities, too.

How can DI possibly help educators rise to the doubly difficult challenge of meeting the demands placed on them to produce high achievement results while concurrently addressing the variety of academic, cultural, and familial diversity in our classrooms? Let's examine some key components of differentiated instruction to understand its fundamental value.

- DI encourages the modification of instruction to address student diversity and to meet curricular objectives.
- DI emphasizes student accountability for learning and high levels of participation through flexible grouping and simultaneous activities, such as learning centers and WebQuests.
- DI features group-driven tasks, but it also relies on whole-class and individualized instruction to complement group work. It focuses on the quality of activities versus the quantity of work assigned.
- DI promotes a comfortable yet challenging learning environment. Teachers realize that their organization and presentation of content profoundly affects students' motivation to learn and their perceived ability to comprehend. Inspired students feel safe in their learning communities and are intrigued by the subject matter at hand.
- DI depends on pre-, ongoing, and post-assessment that utilizes both traditional and nontraditional evaluation methods, such as teacher observation, self-assessment, and project work.
- Teachers who apply DI concepts show a willingness not only to learn more about their students but also to modify instruction to support student needs. As a result, student surveys and other tools used to learn about students are important.

- DI is guided by the constructivist, or student-centered, approach to teaching and learning. Constructivism, one of the big ideas in education that arose during the early 1990s, is the belief that students create or construct their own knowledge and understanding by building on previous learning. Constructivist learning is active rather than passive. Constructivist teachers relinquish their traditional role of "sage on the stage" (the omnipotent keeper of knowledge) to become the "guide on the side" (the facilitator of experiences and opportunities for children to learn).
- In student-centered classrooms, planning, teaching, and assessment are focused on the needs and abilities of students. Why? Because constructivists believe learning is most meaningful when topics are connected to students' needs and interests and when the students themselves are actively engaged in creating, understanding, and connecting to knowledge. Students are motivated to learn when they feel they have a real share in their own learning. In a student-centered classroom, students are given options and are included in decision-making processes. The focus in these classrooms is on choices, rather than on one size fits all. Students are regarded as individuals with thoughts and issues that merit consideration and thoughtfulness.
- DI practitioners make instructional decisions based on student readiness, interests, and learning profile as well as on content, process, and product. Even more recently, teachers who practice DI have begun to focus on student affect and the learning environment.

That said, what about technology? How does it impact learning? What does research about technology in the classroom tell us thus far?

Research on the Impact of Technology on Learning

According to the Center for Applied Research in Educational Technology (CARET), a project of the International Society for Technology in Education in partnership with Education Support Systems and the Sacramento County Office of Education, technology can help improve student performance in six key ways:

1. **"Technology improves student performance when the application directly supports the curriculum objectives being assessed."** In other words, technology is most effective when integrated with curriculum content.

2. "**Technology improves performance when the application provides opportunities for student collaboration."** Studies show that paired and collaborative learning in conjunction with technology enhances student performance.
3. "**Technology improves performance when the application adjusts for student ability and prior experience, and provides feedback to the student and teacher about student performance or progress with the application."** This finding supports the differentiated instruction practices of coaching and mentoring as well as sharing responsibility for learning.
4. "**Technology improves performance when the application is integrated into the typical instructional day."** This finding supports classroom and content learning with technology as opposed to lab learning with technology.
5. **"Technology improves performance when the application provides opportunities for students to design and implement projects that extend the curriculum content being assessed by a particular standardized test."** Student-created products, multimedia, and video streaming are examples of how technology can extend curriculum content.
6. **"Technology improves performance when used in environmentswhere teachers, the school community, and school and district administrators support the use of technology."** In addition to performance improvements tied to administrative support for technology, findings show that integration of technology with instruction, professional development for teachers, and computer use at home and school with differentiated products and student entry points combine to improve performance.

Differentiated instruction focuses on teaching strategies that give diverse students multiple options for taking in and processing information, making sense of ideas, and expressing learning. Technology tools can support good instruction and offer personalized learning environments in which students interact with software, conduct research, create products, and communicate with others outside their school. Both differentiated instruction and technology tools are important for 21st-century education, aka digital age learning.

According to a study by the North Central Regional Educational Laboratory (NCREL) titled "enGauge 21st Century Skills: Literacy in the Digital Age," "[T]echnology has catapulted us into a knowledge-based global society." As a result of technology, what students learn and how and when they learn are changing.

NCREL advises that technology influences learning in these three ways:

1. Technology drives change. As a result, success in society will require skill sets in the 21st century significantly different from those of the past.
2. Technology serves as a bridge to more engaging, relevant, meaningful, and personalized learning, all of which can lead to higher academic achievement.
3. Technology provides a platform for using timely and relevant data to shape personalized learning.

The enGauge 21st Century Skills shown in Table 1.1 are well matched with the principles and practices of differentiated instruction. Combining differentiated instruction strategies with technology will help students attain the 21st -century skills sets.

TABLE 1.1 ■ The enGauge 21st Century Skills

Digital-Age Literacy	■ Basic, scientific, economic, and technological literacies ■ Visual and information literacies ■ Multicultural literacy and global awareness
Inventive Thinking	■ Adaptability and managing complexity and self-direction ■ Curiosity, creativity, and risk taking ■ Higher-order thinking and sound reasoning
Effective Communication	■ Teaming, collaboration, and interpersonal skills ■ Personal, social, and civic responsibility ■ Interactive communication
High Productivity	■ Prioritizing, planning, and managing for results ■ Effective use of real-world tools ■ Ability to produce relevant, high-quality products

The enGauge skills sets offer a quick look at what students will need for the future. What, though, is that state of technology in today's schools? Is there ample and strategic technology integration to help prepare and propel students to actualize 21st-century skills? The following section provides a quick review.

Status of Technology Use in Schools

The use of technology in classrooms appears to range from none, or minimal, to frequent. Although various agencies and groups across the United States have collected data, there's little uniformity on what should be collected and how. As a result, it's difficult, if not impossible, to determine from a global perspective how much technology is used in elementary schools today.

"Technology Counts" is a report (in print and digital formats) produced annually by *Education Week. Education Week* surveys the states to measure the status of K–12 education technology and then creates individual state technology reports based on several criteria: state overview, access to technology, use of technology, the capacity to use technology, state data systems, and data access/analysis tools. *Education Week* analyzes each of the six major categories and makes comparisons among states. A grade is given for each category, and each state receives an overall grade as well. Readers who use the *Education Week* Web site (www.edweek.org) can make online comparisons between their own states and others. If you don't have a personal subscription, your school district or regional school district may subscribe.

The "Technology Counts 2006" report is the ninth report *Education Week* has completed in as many years. Although many states have made great strides toward improving technology in the schools, it's disheartening to read this year's survey results. Why? Because of the 50 states and the District of Columbia, only two states received an A grade for overall technology: West Virginia (94) and Virginia (92). The six states ranking lowest received D+ to D- grades: Hawaii (69), Massachusetts (69), Oregon (66), Rhode Island (65), Minnesota (65), and Nevada (62). The remaining states range from North Dakota, with a B grade (86), through Oklahoma, with a C- grade (70). The overall technology grade average is C+, with a score of 77.

Other recent studies can give you a taste of the status of technology across the country and prompt you to check out your own state's score in the "Technology Counts 2006" report. Or you might contact your state department of education to see what's planned for technology in the near future.

In the 2003 "Use, Support and Effect of Instructional Technology" (UseIT) study of several schools in Massachusetts, some interesting findings were noted at the Grade 5 level:

- Students use computers in school but less than at home.
- Fifth-graders use computers in school more than 8th- and 11th-graders do; but 24.5% of 5th-graders don't use computers, 39.6% use computers for 15 minutes or less per day, and 33.4% use computers ranging from 15 to 60 minutes every day to once per month.
- Teachers use computers during instruction less than students do.

- Key factors affecting elementary classroom use include
  - home use, skills, and beliefs about technology;
  - teachers' pedagogical beliefs and practices;
  - student technology skill level;
  - principals' beliefs about technology;
  - principals' emphasis on technology and pressure to use technology.

Another study, the 2005 "National Teacher Survey," shows that a gap exists between technology for teachers and technology for teaching because the need for data management has begun to supersede the need for instructional use. Why is data management so important? According to *eSchoolNews,* "New technologies, combined with the strict accountability demands of the No Child Left Behind Act (NCLB), have combined to create a climate in which 'Data-informed Instruction' is flourishing. The NCLB has introduced a number of new buzzwords into the lexicon of K–12 educators—and the most significant of them all just might be 'data-driven decision making.'

"Simply put, this concept involves the collection and analysis of test results, demographic information, and other student data to make more informed decisions about instruction—and, given the stringent requirements of NCLB, it's a practice that is no longer an option for today's school leaders, but a necessity."

Other key findings from the survey show:

- Teachers cite computers as effective tools, but only about 54% integrate them into daily instruction.
- Seasoned teachers indicate no resistance to classroom technology.
- Classroom instructional use of computers ranks 4th in the role of technology use by teachers (1st is administrative functions, 2nd is communication, and 3rd is research and planning).

A fourth study, "Effect of the *unitedstreaming* Application on Educational Performance," reports that those students who received instruction that incorporated *unitedstreaming* videos showed dramatic improvement in achievement. *Unitedstreaming* is a browser-based Internet content delivery system developed by Discovery Education. It consists of a collection of more than 4,000 videos and 40,000 chaptered clips of standards-based educational videos, teacher guides, black line masters, student activities, clip art, quizzes, and teacher resources. Conclusions drawn from the study reveal three primary reasons that multimedia and technology are effective in the classroom:

1. Multimedia and technology use engages students, which in turn leads to students who are more attentive, knowledgeable, and higher achieving.

2. Multimedia and technology use leads to teachers who are better prepared and more effective.
3. Multimedia and technology use in the classroom changes the nature of interaction in ways that help students learn.

In its report on the NetDay 2005 Speak Up Event, NetDay, a national nonprofit organization, summarized national data on technology use in education collected from 185,000 student surveys and 15,000 teacher surveys.

The surveys focused on technology products and Internet tools used by teachers and students and how they're using them. Surveys also focused on trends, obstacles and issues, and student achievement through technology.

Survey results determined that:

- Students are innovative users of technology and adopt new technologies to support learning and lifestyles.
- Communication is a key motivator for students, driving their use of technology for learning and for personal use.
- Younger students continue to adopt sophisticated technologies, especially those favored by older siblings.
- Students and teachers want access to current technology tools when they need it. Restrictions to technology use for learning frustrate them.
- Teachers' technology use does not keep up with advances in how students use technology.
- Students believe that technology enriches their learning experiences and prepares them for a competitive job market.
- Students use technology tools for communication, research, completing school projects, and checking on their grades.
- Teachers use technology tools for preparing lessons, keeping records, communication, and research.

As other studies are reported, we'll have a better picture of how technology is used in education. The Irving, Texas, "Laptop Surveys for Teachers" report, for example, offers insight into how laptops are changing instruction in the school district. It would be helpful to see similar studies conducted in each subject area to assess the learning issues specific to that content. However, what remains constant is that knowing how to use technology is increasingly necessary on many levels to function in our society. Teachers need to integrate technology into their classrooms to personalize and facilitate learning, to nourish learners' engagement with curriculum content, and to prepare students for the world of work.

While many teachers still struggle with how to use technology and integrate it into classroom content, those who are more sophisticated in their use of technology may not have thought much about how to use it in a differentiated classroom. In other words, you might be a master at differentiated instruction but not know how to add technology as a differentiation tool. Or you might be a techno whiz but not know much about differentiated instruction.

The power of two—differentiated instruction + technology—will soon be apparent to teachers who successfully use technology in a differentiated environment. Technology is a highly motivating, interactive tool that can be used to personalize students' instruction according to their learning styles, interests, and readiness. Web resources and multimedia software greatly expand learning options and provide information access way beyond the school textbook and media center. Technology can help teachers shape and deliver instruction to meet the needs of all students, assist in the improvement of student thinking, provide for research and presentation products, and improve communication. This book is about combining technology with differentiated instruction in ways that empower student learning.

Technology Features That Support Differentiated Instruction in Elementary Classrooms

Over the last 30 years, studies have shown that the teacher is the most important factor in student learning. Research from Marzano, Pickering, and Pollock (2001) reveals the nine essential instructional strategies most likely to improve student achievement in all grades and any content area. As states and districts become increasingly accountable for academic performance (No Child Left Behind legislation), teachers must become more aware of the instructional strategies that work, and they must employ them.

The nine categories of instructional strategies are listed in order of effectiveness in the first column of Table 1.2 on the following page. Column two lists their corresponding elements in differentiated instruction. Column three lists tech tools such as software and Web sites that support differentiated instruction.

TABLE 1.2 ■ Nine categories of instructional strategies most likely to help students learn

1. Recognizing similarities and differences	Graphic organizers such as the Venn diagram and Comparison matrix Represent similarities and differences in graphic or symbolic form Sorting, classifying, using metaphors and analogies	Inspiration and Kidspiration software Web-based/downloadable graphic organizers Word processing tables (Word software)
2. Summarizing information and taking notes	Beginning, middle, end Clarifying information Teacher-prepared and student-prepared comments Webbing	Cornell Note-taking Forms Inspiration and Kidspiration software NoteStar Read•Write•Think Notetaker Word processing notes (Word software)
3. Reinforcing effort and providing recognition	Effective praise and rewards Effort and achievement rubrics and charts Personalizing recognition Success stories of people who persisted during difficult times	Kids Are Authors (Scholastic) Microsoft Publisher certificates Online certificates Personal achievement logs Word processing feedback notes (Word software)
4. Homework and practice	Planners and organizers Vary student and teacher feedback	Content-related software Homework help sites to extend learning beyond the classroom Word processing planners and organizers (Word software) Word processing feedback notes (Word software)
5. Nonlinguistic representations: ■ Creating graphic representations ■ Drawing pictures and pictographs ■ Engaging in kinesthetic activity ■ Generating mental pictures ■ Making physical models	Cause and effect organizers Concept organizers Drawing pictures, illustrations, and pictographs Graphic organizers Physical models and movement Time-sequence organizers	Digital cameras Graph Club software Inspiration and Kidspiration software Kid Pix software Micro Worlds software Excel spreadsheet software Paint software (Microsoft Windows accessory) PowerPoint software TimeLiner software Virtual manipulative software or Web sites

continued

TABLE 1.2 ■ Nine categories of instructional strategies most likely to help students learn *(continued)*

Effective Instructional Strategies	Application to Differentiated Classrooms	Related Tech Tools
6. Cooperative and collaborative learning groups by ability, interest, and other criteria	Flexible groups by interest, learning style, and readiness Individual and group accountability Vary groups by size and objectives Think–Pair–Share strategy	Group investigations Individual and group assessments Jigsaw groups Multimedia software Scavenger hunts ThinkQuests WebQuests
7. Setting objectives and providing feedback	Learning contracts for achieving specific goals Ongoing assessment Praise Rubrics Self-assessment Student-led feedback Teacher feedback that's timely, specific, and constructive	Electronic journaling (Word software) Learning logs (Word software) Project-based learning checklists (Web-based) RubiStar and other rubric generators Word processing checklists (Word software) Word processing contracts (Word software)
8. Generating and testing hypotheses	Decision making Historical investigation Invention Making predictions Problem solving	Graph Club Kids' mysteries Kidspiration and Inspiration hypothesis Webs Internet research Online graphing generator PowerPoint slideshows Science Court software Word or Publisher reports, mini-books, and advertisements
9. Questions, cues, and advance organizers	Advance organizers Anticipation guides Cubing and ThinkDots activities KWL charts Pause after asking questions	Cubing and ThinkDots templates Inspiration/Kidspiration advanced organizers Online or Word-created KWL charts Word Personal Agendas Word narrative advance organizers

Resources for Chapter 1

Center for Applied Research in Educational Technology (CARET)	http://caret.iste.org
Education Commission of the States Policy Brief: Student Performance and Teacher Accountability	www.ecs.org/clearinghouse/12/28/1228.doc
Education Week's Technology Counts 2006	www2.edweek.org/rc/articles/2004/10/15/tc-archive.html
Effect of the *unitedstreaming* Application on Educational Performance	http://caret.iste.org/index.cfm?StudyID=852&fuseaction=studySummary
eSchoolNews	www.eschoolnews.com/resources/reports/datadrivendecisionmaking/
Integrating Technology into the Classroom Using Instructional Strategies	www.tltguide.ccsd.k12.co.us/instructional_tools/Strategies/Strategies.html
Irving, Texas, Laptop Surveys for Teachers report	www.iittl.unt.edu/irving/IrvingTeacherReport2005.pdf
Kids Are Authors	http://teacher.sckholastic.com/activities/kaa/
MysteryNet's Kids Mysteries	http://kids.mysterynet.com
2005 National Teacher Survey (Teachers Talk Tech 2005)	http://newsroom.cdwg.com/features/2005NatlTeacherSurvey.pdf http://newsroom.cdwg.com/features//TTTCompleteResults.pdf
NetDay 2005 Speak Up Event	www.netday.org/SPEAKUP/pdfs/SpeakUpReport_05.pdf
No Child Left Behind	www.ed.gov/nclb/
North Central Regional Educational Laboratory (NCREL) report: enGauge 21st Century Skills: Literacy in the Digital Age	www.ncrel.org/engauge/skills/engauge21st.pdf
NoteStar	http://notestar.4teachers.org
Use, Support and Effect of Instructional Technology	www.bc.edu/research/intasc/PPT/USEIT_NECC070203.ppt
Who Is Accountable for Children's Education?	www.pbs.org/newshour/btp/pdfs/stlouis_accountability_2005.pdf