



Computers offer multiple ways for teachers to meet the needs of individual learners. Some students learn more easily when they can proceed at their own pace and receive helpful feedback from computer software.

original intent, many regular education students may demonstrate better recall because they too can read as well as hear the material in class.

Roles for Technology

"Minimizing the impact of disability and maximizing the opportunity to participate in the world" is the key to adapting teaching strategies and classroom environments to fit the needs of all learners, asserts Thomas Hehir (2006, p. 8), former director of the U.S. Department of Education's Special Education Programs. Hehir wants educators to emphasize **accommodations**, where students with special educational needs have different ways to access the regular education curriculum. He wants to avoid

what he calls **modification**, where students receive educational experiences less substantive than those received by regular education students.

For example, modification would occur if a learning disabled student was "required to do fewer math problems for homework because he reads slowly." By doing fewer problems than his regular education peers, the child's academic experience is lessened. Instead, that student would benefit from an accommodation that included receiving "a taped version of the assignment and expecting him to do what any other child does" (Hehir, 2006, p. 7).

Computer technology allows for never-before-possible implementations of universal design in schools. For example, schools have always been print-bound institutions, and prior to computers, it was not easy to modify or manipulate printed text so struggling readers could understand it more easily. Digital media makes print materials "malleable: they can be transformed, marked, linked, networked, and customized for each individual learner" (Meyer & Rose, 2005, pp. 17–18). Print-bound content can be displayed in different ways—on screens, through movies and animations, or with speech, sound, and pictures. Materials can be hyperlinked to other sources of information and processed at a pace and in a mode that suits each particular learner. Barriers to student learning are thus significantly and fundamentally reduced.



Classroom Learning with Technology

Every teacher is an instructional designer, deciding everything from how seating is arranged to what instructional activities will be conducted. For teachers concerned about universal design and learning success, no aspect of the classroom environment is too small or insignificant to address because even little items may make the difference between a student paying attention or drifting away from the focus of the class. For this reason, teachers must constantly design and redesign both classroom setting and curriculum content to meet the needs of students.

There are two main routes for designing your classroom using technology: changing the classroom learning environment or changing how the curriculum is delivered.

In the first instance, the classroom's physical structure is changed to fit the needs of all learners. In the second, academic curriculum is presented so students with multiple learning needs can readily access key ideas and concepts.

To begin thinking about designing your classroom, imagine ways to differentiate your teaching. You can use a range of low-tech, mid-tech, and high-tech tools, as described below:

- *Low tech* refers to changes that are made easily, inexpensively, and without applying digital or electronic materials.
- *Mid tech* involves substantive shifts in organization and delivery of curriculum that may include the use of electronic materials.

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Go to the Assignments and Activities section of Chapter 10 in MyEducationKit and complete the video activity entitled "Software for Diverse Learners." As you watch the video and answer the accompanying questions, note the efforts one state is making to incorporate technology into teaching for all students.

- *High tech* introduces changes associated with the integration of computers and other specialized information technologies in the classroom.

Tables 10.1 and 10.2 offer ways to differentiate essential elements in the classroom at the low-tech, mid-tech, and high-tech levels.



Using Assistive Technology to Reach All Learners

Technological convergence describes the combining of multiple features and functions into one digital tool while content flows across multiple media platforms (Jenkins, 2006). Televisions

TABLE 10.1 Classroom Organization Tools

Technology Tool	Low Tech	Mid Tech	High Tech
Chairs and desks	Provide desks and chairs with adjustable heights for different-sized students. For small-sized students who slip out of their chairs easily, use gripping shelf paper to cover the seat.	Provide specially designed seat cushions or "positioning aids" for students who need them.	Provide alternative seating, such as ball chairs.
Whiteboards, chalkboards, chart paper	Write in colors that are visible to individuals who may be colorblind. Avoid light colors. Offer a hard copy of what is on the board for students who find copying from the board a challenge.	Use audio recordings made by classmates of the notes from the board or chart paper. Students can access these audio recordings and listen to the notes or directions via headphones.	Use an interactive whiteboard that offers a printout of notes and directions from the board and allows the font to be enlarged.
Pencils, paper, scissors	Provide a variety of different writing tools, markers, pencils, and crayons, in assorted sizes and different types of pencil grippers. Provide writing paper with different-sized lines and spacing; provide correction fluid or correction paper. Provide left- and right-handed scissors with padding and different finger placement accommodations.	Provide word processing software with spell checking and grammar correction tools that are developmentally appropriate. Provide different textured papers with raised lines that can be seen and felt by the writer; provide portable classroom spellers and small portable write-on and wipe-off boards.	Provide a Tablet PC with a writing stylus and writing software that translates handwritten words into typed text. Provide speech-to-text software that records student voices as text documents.
Reading materials	Provide book highlighting tape, Post-It notes, multiple copies of big books.	Provide books or CDs recorded by the teacher or students and interactive picture dictionaries.	Provide talking books made from classroom books, interactive books, word-by-word highlighting software, text-to-speech software.
Writing	Use audio recordings that can be transcribed into words, dictionaries, thesauri, and magnification tools.	Use magnification software.	Use word prediction software, speech-to-text software, enhanced keyboards.

TABLE 10.2 Classroom Teaching Methods

Delivery Method	Low Tech	Mid Tech	High Tech
Teacher lectures.	Teacher uses large charts for ease of viewing information and a child-sized sound machine to amplify voices for ease of hearing information.	Teacher uses PowerPoint to project information onto a screen. Teacher also uses a classroom amplifier to project voices throughout the entire room.	Teacher uses a personal response system or other computer network to create an interactive lecture format with the students.
Teacher demonstrates.	Teacher uses manipulative materials and provides written directions to accompany oral directions.	Teacher offers digital simulations of manipulative materials to provide a different kind of view or practice.	Teacher offers a simulation of an idea, concept, or phenomenon that cannot be replicated in the classroom without technology.
Student manipulates hands-on materials to solve problems.	Student uses physical materials for experimentation.	Student uses a digital simulation of the same experiment manipulating variables in a virtual environment.	Student accesses digital tools and materials that are not available for hands-on use in the classroom as part of the experiment.
Student works independently.	Student works independently at a desk or table.	Student works independently at a desk or table on a computer using data specifically designed for or chosen based on learning needs.	Student works independently accessing feedback from a teacher about individual work in process.
Students work in groups with a teacher.	Students work alone or share a computer and each assumes a different role in researching, testing, or documenting a hypothesis.	Students work in pairs or small groups using collaborative software while researching, testing, or documenting a hypothesis.	Students work collaboratively utilizing multiple digital feedback mechanisms to publish their research to a wider community.
Students teach each other in peer teaching activities.	Students work together to solve problems.	Students work in small groups developing or experiencing WebQuests.	Students, assigned different roles in the process, work as small-group teams developing or experiencing WebQuests.

connected to other devices in home entertainment centers, Internet navigating equipment, and video game playing consoles are examples of convergence, as are cellular telephones that make calls, take photographs, record and play video, send email messages, and surf the Net. These are all multifaceted machines in streamlined packages performing multiple functions. Broadband cable provides convergence through music downloads, streaming video, automatic bill paying, and real-time instant messenger chats. In retail stores, convergence occurs in cash registers that manage sales and inventory simultaneously while offering a digital pen for customer signatures on purchase agreements.

Technological convergence has evolved quite differently in K–12 schools than in business. For a century the chalkboard was the means by which teachers demonstrated examples, listed procedures, and articulated concepts, while pencils and paper were the tools for written communications. In recent years, Post-It notes have served students and teachers as affordable bookmarks or reminders. Most teachers, however, while relying on these low-tech methods, have not considered the multiple ways they can access the capabilities of computers and other information technologies to reach all learners. In short, they have not begun to utilize the powers of convergence.

TABLE 10.4 Uses of Technology in a "Writing Process Fit to Young Writers"

Writing Process Stage	Teacher Role	Without Technology	With Technology
Prewriting/ brainstorming	Teachers use openers to show children the creative possibilities of different genres and forms of writing.	Teacher openers consist of <ul style="list-style-type: none"> • Read-alouds of children's literature. • Showing examples of children's writing on overhead projectors. • Playing story writing/story telling games. • Discussing genres and forms. 	Technology openers include <ul style="list-style-type: none"> • Interactive computer storybooks, CD-ROM and Web materials, or audio and videotapes. • Microphones or sound systems for read-alouds for individuals or groups. • Digital projectors to make Web and CD-ROM materials as well as children's own writing available to an entire class in a large-group setting. • Author websites with stories, interviews, and writing games.
Drafting	Teachers provide individualized assistance for students as they write so that young writers create a "draft" where ideas flow forth without editing of the text, from which youngsters produce multiple drafts of their writing.	Teachers support children's writing by <ul style="list-style-type: none"> • Acting as a scribe. • Sharing the pencil as co-writers and co-illustrators. • Finding pleasant places for children to write. • Responding in supportive, engaging ways to questions about spelling, punctuation, and other conventions of written language. 	Technology supports include <ul style="list-style-type: none"> • Computer word processing and drawing programs for generating drafts that include written words, pictures, and drawings which can be created by students or students and teachers together. • Text-to-speech software, digital pens, tape recorders, and camcorders to generate drafts of ideas. • Brainstorming and visual thinking software.
Revising/editing	Teachers provide feedback to young writers about the substance and the form of their writing so they can make additions or deletions that will improve the meaning (revising) and the clarity (editing) of written text.	Teachers and young writers engage in revising or editing by using <ul style="list-style-type: none"> • Paper and pencils (or pens) as well as oral conversations. • Reading written drafts in paper copy and making annotations and suggestions in writing on the text or on sticky notes. 	Technology revising and editing include <ul style="list-style-type: none"> • Email communications so teachers and young writers can respond to writing more interactively and dynamically. • Editing software such as grammar and spell checking programs. • "Track changes" editing feature on word processing programs to keep a record of changes as they are made. • Handheld spellers and dictionaries.
Publishing	Teachers assist young writers to "publish" their writing, making what they have written available for different audiences to read and hear.	Teachers publish and celebrate students' work by reading children's writing aloud, displaying stories and poems on bulletin boards, and assembling handmade books.	Technology publishing includes a range of possible venues beyond paper displays: <ul style="list-style-type: none"> • Classroom websites • PowerPoint • Digital portfolios • Tape recorders • Movie-making software • Desktop publishing software for choices of page layouts as well as print fonts and styles to emphasize visual learning and student choice and control over how information is communicated.