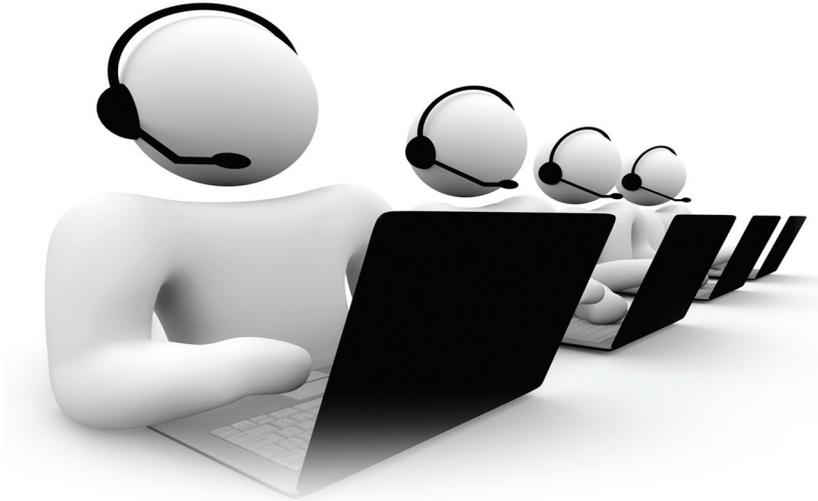


# TEACHING WITH TECHNOLOGY

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BOOKLET

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عمادة تطوير المهارات  
Deanship of Skills Development

# Teaching with Technology

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جميع حقوق الطبع محفوظة

عمادة تطوير المهارات

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## Teaching with Technology



Modern technology, specifically computers and the World Wide Web, has impacted almost every aspect of our daily lives and is often the cornerstone for successful businesses, institutions, governments, and societies. It is not surprising, then, that teachers (as well as college and university administrators) and researchers are examining ways that technology can enhance student learning. Nevid (2011) argued that today's college students are immersed in technology and frequently use it for communication (i.e., text messaging), entertainment (i.e., mp3), and socialization (i.e., Facebook, Twitter). The challenge for teachers is to develop strategies capitalizing on sound pedagogical techniques and maximizing the potential benefits of technology. This booklet will examine educational or instructional technology, address specific technologies that can be easily incorporated into the college classroom, and provide several examples of successful technological integration.

### Technology Broadly-Speaking

Light and Cox (2001) and Bates and Poole (2003) both concluded that classroom technology can be divided into three distinct parts: (a) the type of technology incorporated into the classroom, (b) the method of delivery, (c) the nature of technology-driven interaction. The types of technology that can be successfully incorporated into class are vast, diverse, and constantly-evolving. However, almost any type of technology will generally fall into one of four categories: (a) text-based

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technologies, (b) audio-based technologies, (c) video-based technologies, and (d) multimedia technologies (Light & Cox, 2001). Text-based technologies include e-mail, online chat rooms, discussion posts, blogs, wikis, and forums. Audio-based technologies may include audio recordings of class material (mp3s) or podcasts while video technologies may include vodcasts and video conferencing. Multimedia technology can be simply the combination of text-, audio-, or video-based technology (Light & Cox, 2001) or may involve one or more technology types incorporated digitally (i.e., online; Bates & Poole, 2003).

Technology can be incorporated into university teaching using either synchronous or asynchronous methods (Bates & Poole, 2003). Synchronous methods are delivered in real time and are accessed by both the teacher and the students simultaneously. In an online class, a teacher may broadcast or stream lectures in real time and students can access the broadcast from any location, but only as it is occurring. Other synchronous methods include online chats, instant messages, or video conferencing. Asynchronous instruction does not require that the teacher and students access the technological resource simultaneously, but users can access the resource at any time (or during a fixed interval). Teachers for an asynchronous online class may upload recorded lectures or other materials and students can access it whenever they choose.

Finally, Bates and Poole (2003) distinguished between broadcast and communication interactions. Broadcast interactions are one-way interactions where teachers use technology to relay information to students. For example, teachers may post a class assignment through a file sharing program or common computer storage drive. Communication interactions, however, are two-way and dynamic allowing both the teacher and the student to relay information to each other. E-mail can be used between individuals or groups. Svinicki and McKeachie (2011) argued that technological innovations allow not only for two-way (or bi-directional) interaction, but can also facilitate multi-directional interactions. Multi-directional interactions are characterized by focus not only on the interaction between the teacher and the student, but also interactions among students. Web conferencing, blogs, and wikis provide different ways of facilitating communication, cooperation, and collaboration between group members.

In a broad sense, classroom technology can manifest itself in several forms (text, audio, video, and multimedia), be delivered in many ways (synchronous, asynchronous, or in combination) and foster different types of interactions (broadcasting, communication/bi-directional, and multi-directional). Although

discussions about the general nature of technology are important, more often teachers are interested in the specific types of technology that can be used in the classroom and how each can be successfully incorporated. In the section that follows, I will examine the many different forms of technology that may promote active class participation, engagement, and learning.

### Technologies for the Classroom

Although the list of possible technologies that can be incorporated into the college classroom is seemingly endless, there are numerous technologies that can be (and have been) used successfully. The list and summary provided here is by no means exhaustive and has been compiled from a variety of sources (e.g., Bates & Poole, 2003; Gross Davis, 2009; Howard, 2011; Light & Cox, 2001; Melenbacher, 2010; Svinicki & McKeachie, 2011).

#### E-mail and Listservs

E-mail is perhaps one of the most widely used online technological tools because it provides quick and efficient means of communication. For teachers, e-mail can serve as the primary means of communication with students outside the classroom. Also, frequent e-mail communication can be useful in building and maintaining student-teacher rapport. As an extension of e-mail, listservs provide an easy way to build, manage, and distribute e-mail to a large target audience. Teachers can create a listserv e-mail address and messages sent to or from the listserv address are automatically distributed to all registered users of the listserv. There are two basic types of listservs: moderated and unmoderated. In moderated listservs, the creator or manager of the listserv screens incoming messages before the message is distributed. In unmoderated listservs, messages are distributed without screening. Listservs can be advantageous for collaboration and discussion among large groups. Listserv software is simple to operate (akin to managing a contact directory) and is often free. L-Soft ([www.lsoft.com](http://www.lsoft.com)) is one web site that offers free listserv management software.

#### Blogs and Wikis

Blogs and electronic bulletin boards are similar to an online journal and allow users to write a series of entries and upload them to a web site. Blogs are not limited to textual content, but may include graphic or video components (called vlogs). Other users are typically allowed to post comments or reactions to the author's post and may engage in

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asynchronous dialogue with either the author or other users who are also reading the blog (Gross Davis, 2009). Teachers can use blogs to post discussion topics or facilitate online classroom interactions between students. Students can create blogs as a way of tracking their own understanding of course material or their intellectual development. Blogs are relatively simple to create and many blogging web sites provide quick templates and web space for free. Two examples of free blogging sites are: Blogspot (hosted by Google; [www.blogspot.com](http://www.blogspot.com)) and Word Press ([www.wordpress.com](http://www.wordpress.com)).

Similar to blogs, wikis allow users to create online entries and conveniently post them to a web site. The major difference between blogs and wikis is that wikis are focused on shared authorship. Although an author or group of authors may draft the initial entry, other users can edit, revise, and build the initial entry. The major advantage of wikis is that the writing and development process is collaborative and can build on the strengths of individual contributors (Gross Davis, 2003). However, Gross Davis (2003) also noted that this collaborative process may foster inaccuracies and decrease objectivity. Much like blogs, wikis are simple to construct and manage. Wiki-building sites are generally free and have tutorials and templates that can be readily adopted. For example, Wikispaces ([www.wikispaces.com](http://www.wikispaces.com)) provides free wiki hosting for both individuals and organizations (including educational institutions).

### Social Networks

Richardson (2009) argued that online behavior does not occur in vacuum and is dominated by social interaction. Social networking technology is an online interface that allows users to not only connect with other users, but also to share personal information including text, pictures, and videos. Similar to blogs, wikis, and listservs, social networking technology provides another potential tool for collaboration, student-teacher interaction, and student to student interactions. Many students are already using (or are familiar with) social networking technology and have the necessary technological proficiency needed for classroom integration. Several of the most popular social network sites, including Facebook ([www.facebook.com](http://www.facebook.com)), Twitter ([www.twitter.com](http://www.twitter.com)) and Flickr ([www.flickr.com](http://www.flickr.com)) do not have subscription fees and offer templates or step-by-step setup guides.

### Presentation Technologies

Classroom or instructional technology is not limited to the online environment or reserved for interactions outside of the classroom. Teachers may also utilize technology to enhance existing in-class practices. Presentation software and other

audiovisual technologies are commonly used in-class. Presentation software refers to computer applications, programs, or tools that teachers can use to present visual or audio-visual stimuli in class. Teachers often use presentation software to organize, synthesize, and condense large amounts of information or content into smaller, digestible units. The major advantages of presentation software are the abilities to sequence or order the flow of information for lecture or discussion, to display graphic images which it may be impossible or impractical to display otherwise, and to provide multiple modalities that may enhance student learning. The major disadvantages of presentation software may be presenting too much information simultaneously, presenting information too rapidly, and the inability of students to attend to and consciously process information from multiple modalities. Several ways to combat these disadvantages are to limit the amount of information at any one time in the presentation, provide students with copies/handouts of the presentation before starting, and use the presentation as a guide or prompt for dialogue (Svinicki & McKeachie, 2011). Examples of presentation software include: Microsoft PowerPoint—which is typically bundled with professional versions of Microsoft office; Keynote—an Apple-based presentation software; and Prezi ([www.prezi.com](http://www.prezi.com)) an online-based presentation software that is currently free.

### Personal Response Systems

Personal response systems, also called audience response systems, interactive response systems, or “clickers,” are devices that allow students to answer questions in response to a teacher’s prompts or provide alphanumerical data. Typically, the responses are transmitted through infrared or radio frequency technology from the clicker to a centralized receiver (Burnstein & Lederman, 2006). After receiving students’ responses, teachers can then summarize, display, or aggregate student data immediately and present it to the entire class. Personal response systems can be used for diverse applications including taking attendance, quizzing, and in-class data collection. In a review of studies on motivation and academic achievement, Judson and Sawada (2006) found that students in classrooms using personal response systems were more motivated toward the course, but that academic achievement was not significantly affected. The advantages of personal response systems are that they can engage and motivate students (especially in larger classes), provide immediate feedback during in-class assessments, and can be used for a variety of purposes (surveys, data collection, assessment, etc.). The disadvantages of personal response systems are the increased cost to students (they must purchase

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these devices) and teachers or departments (for the receivers and software) and mixed results on whether they benefit student learning. Recent advances in personal response systems have focused on mobile phone text messaging. Most often, personal response systems are available through textbook publishers or educational technology companies and are managed through relatively simple interfaces.

### Learning Management Systems

Selecting, building, and managing technology can often be a difficult or time consuming task. Fortunately, learning management systems offer teachers an educational platform, typically online, where technological resources can be easily designed, implemented, and managed. Passerini (2008) concluded that most learning management technologies can assist teachers in four domains: (a) course design, (b) course management, (c) collaboration, and (d) administration. In most learning platforms, teachers can build customized online pages for the course using templates, create discussion threads, sharable folders, and upload course documents (i.e., syllabi, readings). Instructors can also build and maintain online quizzes, track student progress, and record student grades. Common collaboration tools available through most learning management systems include online discussion threads, interactive blogs, chat rooms, group management and e-mail, and peer-to-peer file sharing. Administrative tasks can include online security and technical support (Passerini, 2008). Several advantages of learning management systems are that they provide a centralized location for technological resources, are both student and teacher friendly (through design and delivery), and can track or manage student progress (including grades) easily. Unfortunately, learning management systems are often expensive and may require elaborate technological infrastructure and personnel. Several examples of learning management systems include: Blackboard (which now owns WebCT as well), Moodle, and Lotus.

### Conclusions on Technologies for the Classroom

Although there are numerous technologies that can be successfully integrated into the classroom, this section has introduced six of the most commonly used categories: e-mail and listservs, blogs and wikis, social networking technologies, presentation technologies, personal response systems, and learning management technologies. These categories represent technologies that, when used effectively, can promote collaboration, cooperation, engagement, and efficiency. Technology is most effective when teachers incorporated it after careful consideration and planning, and within the larger pedagogical framework of the course.

### Incorporating Technology in the Classroom

The decision to adopt technology in your teaching requires considerable preparation and planning prior to implementation and constant evaluation and redesign after implementation. The magnitude of planning and evaluation will largely depend on the type or amount of technology being integrated in the classroom. Incorporating e-mail, videos, or Powerpoint slides may require minimal preparation or evaluation while building courses in which a majority (or all) of the classroom interaction is mediated by technology may take considerably longer. Koontz, Li, and Compura (2006) proposed the ASSIST-Me model for incorporating technology in the classroom. Although Koontz et al. were specifically addressing the development of online courses, their general outline can be used to understand the process of technological integration for other uses as well. Prior to implementing technology, the teachers should focus on assessing the nature of the classroom and students (including course goals and objectives), understanding the potential pedagogical value of technological inclusion, and selecting appropriate technology based on the instructional needs of the class.

Svinicki and McKeachie (2011) suggested that teaching with technology is a dynamic interplay between the instructor, the student (or students), the technological tools used, and the content of the course. Often the types of technology incorporated may depend on the teacher's own technological proficiency, willingness to learn new programs or software, and the resources available to the teacher (i.e., funds, time). Tice et al. (2005) also suggested that teachers may be limited by institutional resources including appropriate technological infrastructures and experienced technology personnel. Although students have some familiarity with technology, they may not have the required skills or access to utilize some classroom technology (Svinicki & McKeachie, 2011; Tice et al, 2005). To combat this lack of skill, teachers may choose to adopt technology that is familiar to students or provide basic training for the types of technology used. Finally, the content and objectives for the course may be better served by some technology types than others (or no technology at all). For example, writing teachers who stress collaboration and cooperative learning may choose to incorporate blogs or wikis, while communication teachers may choose to develop audiovisual assignments. Teachers should thoroughly assess the course objectives and goals and examine ways that technology may foster attainment of these objectives.

After implementation, instructors should get feedback from students about the

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technology implemented, as well as evaluate and redesign the course around student feedback and their own evaluations of the course (Koontz et al., 2006). From such feedback, teachers can begin to gauge whether the technology is assisting in achieving course objectives (or hindering them), how usable (or student-friendly) the technology is, and ideas about structuring or redesigning future classes. The incorporation of technology in the classroom is often a cyclical process of design, implementation, and redesign fueled by rapid technological innovations and a desire for sound pedagogical practice. In the section that follows, I will examine four examples of how technology has been successfully incorporated into the college classroom.

### Examples of Technology in the Classroom

#### Environmental Problems

Caprariis (2000) developed an online Environmental Problems course that stressed both active and collaborative learning. In this class, Caprariis prompted online discussion by posting information on relevant topics (e.g., rain forests) and having students generate possible research studies that could study the phenomenon of interest. Not only did each student generate an outline for a research study and post it in online discussion forums, they also had to critique and comment on other students' proposals. After critique and discussion, student groups had to create a combined (or collective) outline from which to work. Once each group had a working outline, each student in the group then uploaded articles and summaries for other members in the group. From this collective archive, each member of the group would construct an individual paper on the topic. Grades were determined by each student's contribution to the collective archive, quantity and quality of student interaction, and their written work. Caprariis' approach relied heavily on discussion forums, web sites, and e-mail communication among group members. Caprariis concluded that the two major disadvantages were the inability to cover as much content (when compared to traditional instruction) and the massive amount of email correspondence that resulted.

#### Geography

As part of Helmer and Bloch's (2010) geography course students were required to create and maintain their own blogs. The student blogs are then linked with each other, as well as to the teacher's blog. For each geographical region covered, Helmer

and Bloch posted (on their own blog) discussion topics or assignments that examined some factor of the particular region. Students then created original blog entries incorporating appropriate sources, images, or videos. Blog entries were graded on the accuracy of the geographical information contained and the depth and scope of the entries. Unfortunately Helmer and Bloch did not elaborate on whether students read and commented on each other's blogs. Nonetheless, the advantage of this or similar designs is that blogs create a flexible environment in which students can share their ideas through a variety of formats, facilitate online, asynchronous discussions, and can be maintained even after the class is over. Helmer and Bloch concluded that assessing or commenting on student blogs can be especially challenging if the class is large or there are many blogging assignments.

### Organic Chemistry

Schroeder and Greenbowe (2009) wanted to develop an interactive community in which organic chemistry students could interact with each other, the instructor, teaching assistants, and a librarian. The instructors examined two different technological tools for fostering student dialogue: A WebCT (a learning management system) discussion board and Facebook. Schroeder and Greenbowe constructed a Facebook group (as opposed to a Facebook user profile) and moderated membership and discussions. Although students were given access to both discussion boards, more students utilized the Facebook group than the WebCT group. No student used both simultaneously. Schroeder and Greenbowe found that students in the Facebook group initiated four times as many discussion posts as students in the WebCT group. The authors concluded that prior personal use of Facebook may have influenced students' preference and posting frequency. This example demonstrates that social networking sites can facilitate online interactions in an environment familiar to students.

### Calculus

To combat low levels of teacher-student interaction and large Calculus class sizes, Strasser (2010) developed a Calculus course that used personal response systems, or clickers, throughout the semester. Throughout the semester, Strasser began each class section with several clicker questions tapping conceptual understanding and graded students on participation. The results, aggregated across students, were then displayed and frequently missed concepts were discussed. Clickers were also used to record student attendance and to randomly select students for in-class

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activities. Strasser noted that clickers provided an easy way for students to assess their understanding of calculus concepts (through instant feedback), facilitated greater interaction than traditional methods, and also provided direction for future discussions and lectures. The biggest disadvantages noted were the cost of the hardware and the frequency of technological disruptions.

### Summary

Technology can offer teachers numerous tools to promote in-class engagement, teacher-student and student-student communication, collaborative and cooperative learning, and a supportive learning environment. In summary:

- Technology can enhance pedagogical practice by providing teachers with additional methods for interaction and teaching students course content in familiar and engaging ways.
- Classroom technology is multi-faceted and involves not only the type of technology incorporated into the classroom, but also the method of delivery and the nature of technology-driven interaction.
- Although classroom technology is constantly-evolving and updated, most classroom technology falls into four basic categories: (a) text-based technologies, (b) audio-based technologies, (c) video-based technologies, and (d) multimedia technologies.
- Technology can be divided into two basic delivery methods: (a) synchronous—by which online interactions happen simultaneously between class members, or (b) asynchronous—by which students can access resources during fixed intervals or at any time.
- Classroom technology can be used for broadcasting information (one user to many) or for facilitating two-way (or even multi-way) interactions.
- E-mail and listservs can provide simple, cost effective means for increasing teacher-student and student-student communications
- Blogs and wikis can be used to facilitate, manage, and track progress on individual or collaborative writing assignments
- Social networking technology also be used to promote interaction among students in a familiar environment

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- Presentation technologies can help teachers organize, synthesize, and condense large amounts of information into more manageable units
- Personal response systems, or clickers, can promote student engagement and can be used for in-class quizzing, surveys, and data collection.
- Learning management systems can help teachers integrate diverse technological resources into a single interface.
- The decision to include technology requires a thorough analysis of the course objectives and goals as well as the technological abilities of the teacher and students
- The types of technology available to an instructor may be limited by the cost of the technology and the lack of an appropriate technological infrastructure
- Successful adoption of technology requires constant evaluation and redesign
- Technology can be incorporated in almost any field including science, mathematics, and liberal arts.

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### Annotated References

- Bates, A. W., & Poole, G. (2003). *Effective teaching with technology in higher education*. San Francisco, CA: Jossey-Bass.
- The authors break the incorporation of educational technology into three basic components: (a) fundamentals, (b) course design and delivery, and (c) change and stability. In the first component, the authors focus on the increasing role of technology in higher education and provide strategies for the types of technology to adopt. The second component addresses some of the theoretical and practical questions surrounding course design and implementation of technology. Finally, Bates and Poole address how instructors can address the dynamic nature of technology.
- Gross Davis, B. (2009). *Tools for teaching*. San Francisco, CA: Jossey-Bass.
- The author provides an overview of the major issues in higher education pedagogy. Chapters focus on a wide range of topics including course design, diversity, generating discussion, motivating students, and techniques for effective course management. In the chapter on technology, Gross Davis describes the most common types of technology currently being integrated in higher education and provides detailed guides for implementing technology within a broader pedagogical framework.
- Koontz, F. R., Li, H., & Compura, P. (2006). *Designing effective online instruction: A handbook for web-based courses*. Lanham, MD: Rowman and Littlefield.
- The authors provide an overview of instructional technology and argues that online teaching needs to be developed, analyzed, and implemented with the same experimental and theoretical rigor as more traditional methods. The second half of the book details the ASSIST-Me model which outlines seven steps that instructors can follow to implement technology effectively. These steps cover the entire technological adoption process from selecting the appropriate technologies and using technologies to support pedagogical objectives to implementing and evaluating classroom technology.
- Light, G., & Cox, R. (2001). *Learning and teaching in higher education*. Thousand Oaks, CA: Sage.
- This book examines key issues related to teaching in higher education including course design, assessment, evaluation, and technology. In their

chapter on technology, the authors discuss the broad categories of technology text-based, audio-based, video-based, and multi-based types of technology. Light and Cox also discuss how technology may impact intellectual, practical, personal, and social learning.

- Mehlenbacher, B. (2010). *Instruction and technology: Designs for everyday learning*. Cambridge, MA: The MIT Press.
- This book examines the emerging role of technology in higher education and provides a thorough review of the studies examining technology-mediated learning. In addition, he provides numerous theoretical models for understanding classroom technology. Finally, Mehlenbacher addresses the potentials and drawbacks of technological inclusion.
- Richardson, W. (2009). *Blogs, wikis, podcasts, and other powerful web tools for classrooms* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Corwin Press.
- The author provides a simple introduction to blogs wikis, podcasts, Twitter, Flickr, and RSS feeds. In addition to orienting the reader to what each type of technology encompasses, Richardson also provides chapters on how to successfully incorporate each into the classroom. This resource would be advantageous for instructors who need a basic understanding of each technology type and simple tips on how best to incorporate each in the classroom.
- Svinicki, M., & McKeachie, W. J. (2011). *Teaching tips: Strategies, research, and theory for college and university teachers* (13<sup>th</sup> ed.). Belmont, CA: Wadsworth Publishing.
- The authors provide a concise reference book for college and university teachers. Topics range from course design and ethics to dealing with troublesome students. In their chapter on technology, Svinicki and McKeachie outline common technologies used in higher education and provide strategies for successful implementation of technology in the classroom.
- Tice, S. L., Jackson, N., Lambert, L. M., & Englot, P. (2005). *University teaching: A reference guide for graduate students and faculty*. Syracuse, NY: Syracuse University Press.
- Similar to Gross Davis (2009) and Svinicki and McKeachie (2011), this book discusses a wide range of issues in higher education, from course design

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and leading discussions, to assessment and mentoring. In their chapter on technology, Tice et al. discuss conceptually how instructor needs, student abilities, classroom objectives, and institutional support can influence the adoption of classroom technology. They also provide strategies for increasing communication and interaction with online course components.

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