PART VI

Enhancing Students’ Learning and Motivation

29. Helping Students Learn
30. Learning Styles and Preferences
31. Motivating Students
32. Informally Assessing Students’ Learning
33. Mobile Learning
Helping Students Learn

You can improve your students’ academic performance by incorporating concepts derived from research into how learners acquire, process, integrate, retrieve, and apply information and skills. Research validates the following general principles (adapted from Bransford et al., 2000; Donovan et al., 1999):

- Students who have inaccurate or incomplete assumptions and beliefs about a topic will have difficulty grasping new concepts and information.
- Students can more easily recall what they already know and integrate new material when they are given a conceptual framework.
- Dividing new material into discrete chunks improves students’ acquisition of that material.
- All learners need practice, feedback, and review.
- Social interactions and discourse facilitate learning and motivation.
- Students’ motivation affects the amount of time and effort they are willing to devote to learning.
- Because learning tends to be situation-dependent, students may need help in transferring material learned in one context to other contexts.

These principles suggest the following practices (adapted from Bransford et al., 2000):

- Introduce a new topic by reviewing background and prerequisite information, taking care to dispel common misconceptions.
- Announce the learning objectives: the knowledge or skills you expect students to acquire during the class meeting or the upcoming sessions.
- Emphasize fundamental concepts and principles.
- Present material in organized, manageable chunks that include opportunities for practice.
- Ask students to demonstrate mastery by answering questions or showing what they have learned.
- Give feedback to students to reinforce their learning.
- Provide opportunities for students to generalize, apply, and transfer what they have learned.
The suggestions below are designed to help you optimize student learning for long term retention and retrieval, and flexible adaptation to new problems and settings.

**Promoting Students’ Intellectual Development**

*Become familiar with models of intellectual development.* Perry (1970) has conceptualized college students’ intellectual development as a series of nine stages commonly grouped into four substages. The earliest stages are dominated by either-or thinking (dualism). Students at these stages believe that there is a single right answer; that knowledge is a set of indisputable truths, and that education consists of a professor giving authoritative explanations to students. Belenky, Clinchy, Goldberger, and Tarule (1986), in examining women’s epistemological development, describe this situation as “received knowledge,” a dependence upon authority. As Erickson, Peters, and Strommer (2006) point out, students at these stages become uneasy when they are asked to think independently, draw their own conclusions, or state their own points of view; they are also uneasy when authorities disagree.

Over time, students begin to revise their thinking as they encounter more areas of disagreement among authorities, compare different interpretations, and realize that on some topics no one has definitive answers. In these next stages (which Perry [1970] calls *multiplicity* and Belenky et al. [1986] call *subjective knowledge*), knowledge no longer consists of right and wrong answers; knowledge becomes a matter of educated opinion. They see both faculty and students as entitled to have their opinions, and they initially treat all opinions as equally valid. This mode of thinking is dominant among college students (Kurziss, 1998).

Students’ thinking begins to change again after instructors and peers repeatedly ask them for evidence to support their points of view. As students learn to distinguish weak evidence from strong, they also come to see that knowledge is contextual and situational. What one “knows” is relative and affected by one’s values, assumptions, and perspectives (relativism/procedural knowledge). Ambiguity is a part of life. Faculty are now viewed as experienced resources, who teach specialized procedures for reasoning within a discipline and who can help students learn the skillful use of analytic methods to explore and compare alternative points of view.

In the final stages of cognitive development, students begin to take their own stands on issues on the basis of their own analysis, which they view as the product of their values, experience, and knowledge. Perry (1970) calls this “commitment
in relativism,” reflecting the need to take a position and make a commitment. Belenky, Clinch, Goldberger, and Tarule (1986) describe this level as “constructed knowledge,” integrating knowledge learned from others with knowledge learned from self-experience and self-reflection.

**Provide sufficient structure for students in introductory courses.** Students in introductory courses are more likely to want yes-or-no answers, and some may have little patience for open-ended discussions. When you grade these students’ papers, be explicit about your criteria so that students do not dismiss your comments as simply “your opinion.” (Sources: Erickson et al., 2006; Tiberius, 1999)

**Help students become more intellectually sophisticated.** Encourage students to move beyond either-or thinking (adapted from Schmidt and Davidson, 1983, and cited in Tiberius, 1999):

- **Help students appreciate other points of view.** Challenge students’ clichés; ask them to provide evidence in support of their opinions; reinforce the value of entertaining competing points of view; support students in their growing awareness that there is no shame in changing one’s mind after weighing well-reasoned arguments.

- **Help students evaluate different points of view.** Explore why some points of view are logically stronger than others; help students understand why authorities disagree; identify criteria for judging between conflicting points of view; divide arguments into component parts; discuss the relative validity of different types of evidence.

- **Help students understand the process of making judgments.** Remind students to rethink their decisions when conditions change or when new information comes to light; discuss how to make decisions when information is uncertain; explain reasoned judgment; encourage probabilistic statements.

**Include real-world experiences in your courses.** Hands-on activities or fieldwork provide a bridge between abstract and concrete learning, and they can help students develop a more complex approach to learning. (Source: Kurfiss, 1998)

**Be sensitive to students’ struggles.** Students may need guidance and empathy in coping with multiple points of view, making wrong decisions, and dealing with uncertainties. Dogmatic students may need help in seeing others’ points of view; indecisive students may need help in forming judgments; complacent students may need help in thinking skeptically. (Sources: King and Kitchener, 1994; Kurfiss, 1998; Schmidt and Davidson, 1983; Tiberius, 1999)
Helping Students Contextualize New Information

Emphasize deep learning. Students engaged in “deep learning” try to understand the significance and meaning of new material, and they strive to integrate new information with what they already know. In contrast, students engaged in “surface learning” do just enough to complete the task or pass a test: they memorize information, make little effort to relate new information to old, and treat learning as an externally imposed task. Deep and surface approaches are not fixed. Students adopt an approach depending upon their view of the task. At different times, students may use deep or surface approaches. Research shows that students who acquire a deep understanding of course content retain it longer and achieve higher grades than students who learn only on the surface.

Try to provide a context that encourages deep learning:

- Help students develop a strong conceptual framework that they can use to organize information into meaningful patterns.
- State learning objectives that emphasize synthesis, evaluation, and analysis.
- Keep workloads and schedules manageable.
- Focus on issues that are most problematic for students, especially the inconsistencies or misconceptions that prevent them from understanding new material.
- Avoid assignments and tests that require the recall of trivial details.
- Encourage students to apply concepts to real-life problems and experiences.

The Biggs Study Process Questionnaire (Biggs et al., 2001) and the Lancaster Approaches to Studying (Ramsden, 2003) can be administered to students to help them explore whether they use deep or surface strategies. (Sources: Bacon and Stewart, 2000; Donovan et al., 1999; Fry et al., 2003; Ramsden, 2003; Roediger et al., 2002; Svinicki, 2004)

Work through students’ erroneous preconceptions. Learners tend to place new material in the framework of what they already know about the subject. When new material conflicts with students’ earlier understandings or beliefs, they may distort the new information so that it fits into their existing framework. In structuring your course and in providing feedback, ask yourself, What do my students know? What don’t they know? What might they mistakenly believe they know? (Sources: American Psychological Association, 1997; Dochy et al., 1999; Donovan et al., 1999; Bransford et al., 2000; Linn, 2006; Pellegrino et al., 2001; Taber, 2001)

Assess what students know at the beginning of the term. What and how much is learned in any situation depends on a student’s prior knowledge and experience.
Devise diagnostic tests or other means to identify what students know about the topic. (Sources: Dochy et al., 1999; Halpern and Hakel, 2003)

**Present material in ways that are meaningful to students.** Let students know what they are expected to learn, and alert them to key points (“Now, this is really critical”). Limit each course session to three or four key points. Similarly, to maximize retention and retrieval, address fewer topics in greater depth over the term rather than cover many topics superficially. Try to tailor your examples to your students’ interests and backgrounds, and encourage students to relate a new topic to what they already know. (Sources: American Psychological Association, 1997; Bacon and Stewart, 2006; Donovan et al., 1999; Erickson et al., 2006; Lowman, 1995; Svinicki, 2004)

**Give students a framework within which to fit new information.** Use outlines, study guides, and other aids to help students see conceptual frameworks and systems. Focus on key concepts, and use a vivid story or memorable example to illuminate key concepts. Refrain from mentioning stray bits of data and details that may overwhelm or confuse students. (Sources: Bransford et al., 2000; Graesser et al., 2002)

**Recognize that different students learn, think, and process information in different ways.** Learning is a highly individual process. Because learning is based on personal constructions of meaning, perceptions of the learning situation, and prior experiences of learning, students vary in how they learn—and how long they take to learn. These differences are more noticeable when the new information is abstract and complex rather than simple and concrete. Moreover, learners do not make uniform progress. Sometimes students reach plateaus and their rate of learning slows down. Research also suggests that men and women may differ in “ways of knowing” and that women may respond better to certain types of learning strategies, such as small-group discussion and experiential learning activities. (Sources: American Psychological Association, 1997; Belenky et al., 1986; Hayes and Flannery, 2000; Prosser and Trigwell, 1999)

**Helping Students Retain, Retrieve, and Apply Information**

**Emphasize the value of review.** Studies suggest that within a matter of days or weeks, students may forget up to half of the new material they have encountered if they do not continue to review that material. To help students retain key concepts, encourage them to develop retrieval cues (such as mnemonics or visual images). In class, reiterate important points throughout the semester. (Sources: Bransford et al., 2000; Grasha, 1996)
Recognize that mental effort or concentration can be a limited resource. Cognitive load theory hypothesizes that the mental effort people can devote to challenging tasks is limited. If the demands of a task exceed available mental effort, performance will suffer. A certain amount of mental effort is needed to meet the cognitive demands of a task, and additional effort or capacity is needed to reflect on and learn from that task. Students may be able to complete an activity but learn nothing from it; if they use all available mental effort to complete the task, no spare effort will be available for learning the task.

Because of cognitive load, a more complex activity may be less effective for learning than a simpler one. When information is new, complex, and challenging, cognitive capacities of learners may be overwhelmed.

Help students’ mental efforts by managing cognitive load, providing sufficient learning time, discriminating among core and tangential information, and recognizing that students may fail at tasks because of overwhelming cognitive load and not because of lack of motivation or effort. (Sources: Chew, 2007; Clark et al., 2006)

Provide opportunities for active learning. Students learn by doing, writing, discussing, and other activities and situations that allow them to test what they have learned and how thoroughly they understand it. The more opportunities students have to restate or apply key concepts, the better they will be able to remember those concepts. In a phrase: Don’t tell students when you can show them—and don’t show them when they can show themselves. Ask students to summarize, paraphrase, or generalize about important concepts through discussions, role playing, simulations, case studies, and written assignments. (Sources: American Psychological Association, 1997; Lowman, 1995; Mentkowski and Associates, 2000)

Encourage cooperation and group work. Learning is enhanced by social interaction, as students build communities of practice, test their understanding, and repeat and review material. Collaborative teamwork and projects undertaken by heterogeneous groups encourage higher-order thinking and problem solving. (Sources: American Psychological Association, 1997; Peligrino et al, 2001; Ybarra et al., 2008)

Vary the context and conditions for learning and testing. Learning is generally enhanced when learners encounter the same principles in a variety of contexts or formats (for example, auditory, verbal, visual, and spatial presentations). Although students may prefer solving homework problems that are exactly like those discussed in class, they are more likely to master the concepts if the problems are different. (Sources: Bransford et al., 2000; Halpern and Hakel, 2003)
Create opportunities for students to learn in the context of real-world challenges. Real-world challenges reflect how knowledge is obtained and applied in everyday situations—called situation learning. Examples of situation learning include asking students to create archives of primary source materials on a particular topic, interview an individual for an oral history, or develop a marketing campaign for a nonprofit. (Sources: Anderson et al., 1996; Lave and Wenger, 1991)

Give students specific pointers. Frequent, immediate, and specific feedback helps students learn, and most students increase their effort in response to praise and encouragement. Focus your comments on one or two items at a time, helping students see the destination, the path, and the next immediate steps. Constructive criticism and evidence of progress will sustain students’ motivation to learn and to persevere. (Sources: American Psychological Association, 1997; Hattie and Timperley, 2007; Lowman, 1995; Weimer, 2002)

Give students opportunities for self-reflection. Self-beliefs (“I am terrible at math”), emotions, and anxieties can interfere with learning. So can the misconception that learning simply “happens” without effort or perseverance. To the extent possible, maximize students’ passion for the content and minimize their anxieties. Some students may benefit from keeping a learning log (notes on what and how they are learning) or a learning agenda (what they need or want to learn and a plan of action). (Sources: Fink, 2003; Halpern and Hakel, 2003; Leammson, 1999; Mientkowski and Associates, 2000)

Design tests that emphasize what you want students to learn. Studies show that studying for frequent quizzes enhances students’ long-term retention. What students remember (and what they forget) is also influenced by the kind of material that appears on tests. Cumulative tests—those that touch on all the topics already covered in the course, not just the most recent ones—are extremely effective (though highly unpopular) because they require students to continually review and integrate the course material. (Sources: Bacon and Stewart, 2006; Halpern and Hakel, 2003; Roodiger and Karpicke, 2006; Rohrer and Pashler, 2007)

Student Note Taking

Encourage students to take notes. Note taking increases students’ attention in class and increases their performance on tests, although note taking can also interfere with students’ efforts to understand the content. (Source: Piolat et al., 2005)
Researchers estimate that typical students record only about one-third of the important ideas in a lecture (Kiewra, 2002). Try these strategies to facilitate better note taking by your students (adapted from Armbruster, 2000; Chew, 2007; DeZure et al., 2001; Kiewra, 1987; Peverly et al., 2007; Titsworth, 2004):

- Pace your speech to give students time to write.
- Pause periodically to allow students time to assimilate and record information.
- Provide an outline that alerts students to the organizational pattern.
- Use cues to reinforce the organization of ideas: topics, definitions, examples, applications, and the like.
- Flag key concepts and important ideas ("Be sure to highlight this concept").

Some faculty ask students not to take notes for a segment of the class, for example, when the instructor is working through a problem on the board. After the demonstration, they give students five minutes to write down the example and the solution.

**Give students opportunities to review their notes during class.** “Remember when we discussed the Grand Unification Theory? You should have that in your notes. What do you have written down?” Or stop five minutes before the session ends and ask students to review their notes and highlight or underline key concepts. Some instructors tell their students which key points they should highlight. (Source: Chew, 2007)

**Give students pointers on how to take notes in your class.** Some faculty advise students in note-taking techniques such as these (adapted from Armbruster, 2000; Bjork, 2001; Helt, 2007; Kiewra, 1987; Peverly et al., 2007; Titsworth and Kiewra, 2004):

- Develop symbols or indents to distinguish major from minor points.
- Leave blank spaces for material or points you don’t understand.
- Wait until an idea has been presented in full before writing notes about it.
- Paraphrase main ideas and concepts in your own words rather than writing things down verbatim.
- Review webcasts or podcasts of lectures to fill in blanks in your notes.

One faculty member requires each student to sign up to take notes for one class during the semester. With a large class, this provides multiple sets of notes for each day. These notes are placed online so that all the students can see how others have organized and interpreted the material.
**Self-Regulated Learning**

**Help students become self-regulated learners.** Self-regulated learners monitor and manage their learning resources (such as time, study space), motivation, and strategies. They set goals for increasing their knowledge, select appropriate strategies, manage their efforts, respond to external feedback, and monitor the cumulative effects of their practices. Self-regulated learners are aware of their own knowledge, beliefs, motivations, and cognitive processing. (Sources: Pintrich, 2000; Schunk, 2004)

**Give students choices.** For self-regulation to occur, learners must have some choice in their methods of learning, time spent studying, the setting where learning occurs, and so on. When learners have few choices, their behavior is externally regulated rather than self-regulated. (Source: Zimmerman and Schunk, 2001)

**Introduce the notion of metacognitive skills.** Metacognition is the process of reflecting on, regulating, and directing one’s cognitive processes. Studies have shown that learners who monitor their own understanding have better recall when they are tested. Help students learn how to explain concepts to themselves, stay on task, note gaps in their comprehension, plan ahead, self-correct errors, and apportion time and effort. (Sources: Bransford et al., 2000; Donovan et al., 1999; Fink, 2003; Koriat and Helstrup, 2007; Pellegrino et al., 2001)

**Provide frequent assessments and pointers.** When an instructor provides frequent assessments and feedback, students can better monitor their progress, become aware of what they do not know, and determine whether their learning strategies are working. Feedback clarifies the standards for good performance, which helps students identify the strengths and weaknesses of their own work. (Sources: Bransford et al., 2000; Butler and Winne, 1995; Kruger and Dunning, 1999; Nicol and Macfarlane-Dick, 2006)
Helping Students Develop Effective Learning Strategies

Give advice on how to study and learn. Unfortunately, few students have been taught how to study (Gardiner, 1998). You can help your students become self-regulated learners by coaching them on how to improve their reading comprehension and retention, how to take notes, how to participate in class discussions, and how to study for tests. Most students can benefit from the following strategies (adapted from Bjork, 2001; Rohrer and Pashler, 2007):

- Divide up the material to be studied. Research shows that reading five to seven pages of a text each day is better than reading the entire chapter a day or two before the test.
- Organize the information. Summarizing key points or generating new examples leads to better long-term retention than reading passively.
- Generate questions about the material as a way of focusing study efforts and identifying what is known and what is not known.
- Form a study group. Students benefit from hearing other points of view and from seeing how others organize the material.
- Practice by saying ideas aloud, making mental pictures of ideas, and associating new knowledge with something familiar.
- Schedule a series of study sessions rather than cramming right before a test.
- Avoid overlearning. Time spent studying material that has already been mastered is an inefficient strategy for long-term retention. Once students have mastered the content (achieved one perfect run-through), it is more effective for long-term retention to review concepts and materials learned weeks or months earlier.
- Balance study with sleep, healthy meals, and exercise.
- Seek help from teachers, tutors, and other students.

Structure assignments to encourage realistic planning and minimize procrastination. Left to their own devices, most students do not take advantage of long deadlines: if you assign a term paper in the fifth week of a fifteen-week semester, the typical student will spend five weeks, not ten, on the project (Ackerman and Gross, 2005). In addition, students tend to greatly underestimate how long an academic task will take. Here are some strategies to discourage procrastination and facilitate realistic planning (adapted from Ackerman and Gross, 2005; Buchler et al., 2002; Wolters, 2003):

- Devise assignments that appeal to students’ interests, professional aspirations, and desire to participate in real-world situations.
- Give students a choice of assignments.
• Provide clear instructions on how to get started and how to proceed. Students who are confused about what is expected are more likely to procrastinate.
• Break large tasks into parts, and set deadlines for each part. Show students how to turn assignments into manageable chunks that require about an hour’s work on any given day.
• Help students set reasonable expectations about the amount of effort needed to complete a task.
• Encourage students to generate their own schedules for finishing the assignment.

References

Enhancing Students' Learning and Motivation


Learning Styles and Preferences

The concept of learning styles derives from the observation that individuals have characteristic and preferred ways of gathering, interpreting, organizing, recalling, and thinking about information. Some learners prefer to work independently, while others do better in groups. Some prefer to absorb information by reading; others like hands-on experimentation. No one style of learning has been shown to be more effective than any other.

Researchers disagree about the value and utility of the various models and theories of learning styles. Some argue that the models have little practical application (Kratzig and Arbuthnott, 2006; Leammon, 1999); others cite data showing that educators can increase students’ academic performance by focusing on learning styles (Dunn and Griggs, 2000).

For college faculty, the concept of learning styles serves as a useful reminder that both students and instructors may benefit from expanding their repertoire of cognitive strategies and processes. For example, instructors with strong analytic styles may want to also present explanations that will satisfy students whose styles are more intuitive and inductive. Instructors with predominantly intuitive styles may want to think about incorporating material that will meet their analytic students’ preferences for definition and structure. Keep in mind that styles of learning do not make nearly as much difference in student achievement as do students’ prior knowledge, skills and abilities, and motivation (McKeachie, 1995).

General Strategies

Vary your teaching methods, assignments, and learning activities. Experiment with different modes of presentation: lectures, discussion, reading assignments, audiovisual materials, and hands-on activities. Give students opportunities to do group work as well as to work alone. Try to provide options for assignments: written papers, oral reports, and multimedia portfolios. (Sources: American Psychological Association, 1997; Chism et al., 1989; Sarasin, 2006)
Give exams that call on different cognitive skills. For example, a midterm might include questions that ask for specific information (recall) and questions that require focused analysis (compare and contrast) as well as short-answer items that call for problem solving or the practical application of theoretical principles. (Source: Claxton and Murrell, 1987)

Encourage students to value different learning styles and orientations. Students may prefer to work with classmates whose learning styles are similar to their own, but some research suggests that students may gain useful insights from working with a variety of learners. Other research posits that learning styles may be related to cultural norms. For example, students from cultures that value the group may have a preference for collaborative learning environments. (Sources: Anderson, 1988; Bonham, 1989; Irvine and York, 1995; Nisbett, 2003; Sánchez, 2000)

Models of Learning Styles

Taxonomy of models. Cassidy (2004) summarizes attempts to simplify and categorize dozens of models of learning styles. He also critiques various self-report questionnaires that measure learning style. Four models of learning styles are briefly described here.

Kolb’s learning styles. Kolb (1984) identifies four types of learners:

- Convergers rely on abstract conceptualization and active experimentation; they like to find concrete answers and move quickly to find solutions to problems; they are good at defining problems and making decisions.
- Diversers use concrete experience and reflective observation to generate a range of ideas; they excel at brainstorming and imagining alternatives.
- Assimilators rely on abstract conceptualization and reflective observation; they like to assimilate a wide range of information and recast it into a concise logical form; they are good at planning, developing theories, and creating models.
- Accommodators are best at concrete experience and active experimentation; they often use trial-and-error or intuitive strategies to solve problems; they tend to take risks and plunge into problems.

In terms of classroom activities, convergers tend to prefer solving problems that have definite answers. Diversers may benefit more from discussion groups and working collaboratively on projects. Assimilators would feel most comfortable...
observing, watching role plays and simulations in class, and then generating concepts. Accommodators may prefer hands-on activities.

**Visual, aural, read/write, kinesthetic (VARK).** The VARK model posits four principal modalities for taking in information: visual, aural, reading and writing, and kinesthetic (hands-on manipulation). Individuals are assumed to have one predominant style for learning new information (Fleming and Mills, 1992), although styles may vary by task and situation, and preferences may blur over time. In terms of teaching strategies, an instructor might want to combine visual representations (diagrams, flow charts), auditory activities (lectures, debates), reading and writing assignments, and kinesthetic activities (role playing and field trips).

**Multiple intelligences.** Gardner (1999) discusses eight types of intelligence: verbal-linguistic, mathematical-logical, musical, visual-spatial, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic. Most people are stronger in one or two types of intelligence and weaker in others. Traditional college courses tend to emphasize verbal-linguistic and mathematical-logical thinking. To enhance learning, instructors are encouraged to combine strategies that tap the other intelligences, for example, by using narrative, music, role playing, free writing, and pair work.

**Thinking styles.** Sternberg (1997) relates thinking styles to intellectual self-government: legislative thinking is aimed at creating and formulating, executive thinking at implementation, and judicial thinking at evaluation and judgment. Sternberg’s model describes four types of thinkers: monarchical thinkers prefer to do one task at a time; hierarchial thinkers like to deal with many tasks but recognize some as more important than others; oligarchic thinkers are comfortable dealing with many tasks but have trouble setting priorities; and anarchic thinkers take a random approach to tasks and dislike constraints. According to Sternberg, individuals have a preferred style but also combine different styles to meet specific situations.

### Helping Students Recognize Their Learning Styles and Preferences

**Explain the value of knowing about learning styles.** The concept of learning styles may help your students understand their own learning processes, identify their learning needs, develop new learning behaviors, analyze what successful learners do, and learn more effectively. In this spirit, you might ask students to notice what actions they take when they are trying to learn something. For example, when trying to learn a new software application, do they read the manual? learn
through trial and error? ask someone to show them? You could also ask students to think about what kinds of learning activities they find most rewarding and what kinds they most dread. (Sources: Erickson et al., 2006; Sims and Sims, 1995)

**Refer interested students to self-scored surveys.** Students can identify their strengths and weaknesses by using such online inventories as VARK (www.vark-learn.com), the Motivated Strategies for Learning Questionnaire (www.ule.arizona.edu), or Kolb’s Learning Style Inventory (Duff, 2004). Let students know that these questionnaires are not intelligence tests of any kind; they are intended only to help students become more aware of how they learn. Advise students to ignore any results that do not ring true to their own judgments of how they learn best.

**Administer a checklist.** Researchers have developed checklists that students can complete to help them understand how they have learned a specific skill or domain of knowledge. Checklist items include the amount of time spent on learning, the motivation for learning, the learning processes employed (doing, observing, practicing), and the cognitive processes used (analyzing information, using rules to guide thinking, and forming principles). (Source: Grasha, 1990)

**References**


Learning Styles and Preferences


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Motivating Students

Some students seem naturally enthusiastic about learning, but many need—or expect—their instructors to inspire, challenge, and stimulate them. Whatever level of motivation your students bring to the classroom will be transformed, for better or worse, by what happens in that classroom.

Unfortunately, there is no single formula for motivating students. Many factors affect students’ motivation to study and learn (Brophy, 2004; Svinicki, 2004; Wlodkowski, 1999): interest in the subject matter, perception of its usefulness, general desire to achieve, self-confidence and self-esteem, as well as patience and persistence. And, of course, not all students are motivated by the same values, needs, desires, or wants. Some of your students will be motivated by winning the approval of others, some by overcoming challenges, some by achieving mastery, and some by obtaining good grades.

To encourage students to become self-motivated learners, research suggests that instructors use the following strategies:

- Give frequent, early, positive feedback that supports students’ beliefs that they can do well.
- Ensure opportunities for students’ meaningful success by assigning tasks that are neither too easy and fail to challenge them nor too difficult and overwhelm them.
- Communicate personal interest in students by calling them by name, initiating conversations with them before or after class, asking questions during class, and referring to “our” class.
- Use teaching strategies that engage and actively involve students.
- Help students find personal meaning and value in the material.
- Create a classroom environment that welcomes the successes and accepts the stumbles and failures that accompany learning.
- Help students feel that they are valued members of a community of responsible learners.

(Sources: Barron and Hulleman, 2006; Benson and Cohen, 2005; Bligh, 2000; Covington, 1997; Cross, 2001; Lowman, 1995; Sleigh et al., 2002; Theall, 1999; Wilson, 2006)
Good everyday teaching practices can do more to counter student apathy than special efforts to affect motivation directly. Most students respond positively to a well-organized course taught by an enthusiastic instructor who has a genuine interest in students and what they learn. Thus, activities you undertake to promote learning will also enhance students’ motivation.

**General Strategies**

*Be enthusiastic about your subject.* An instructor’s enthusiasm is a crucial factor in student motivation. If you seem bored or apathetic, students will lose interest and momentum. Think back to what attracted you to the field and bring those aspects of the subject to life for your students. If portions of the material seem dull to you, challenge yourself to devise the most exciting way to present that material.

*Address students’ basic needs and desires.* Students’ needs and desires include succeeding in a task or activity, perfecting skills, overcoming challenges, acquiring competency, having new experiences, feeling involved, and interacting with other people. Satisfying such needs is rewarding in itself, and such intrinsic rewards sustain learning more effectively than grades do. Design assignments, in-class activities, and discussion questions that tap these dimensions. (Source: McMillan and Forsyth, 1991)

*Create opportunities for active participation.* Passivity dampens students’ motivation and curiosity. Students learn by doing, making, writing, designing, creating, and solving. See Chapter 9, “Leading a Discussion”; Chapter 18: “Encouraging Student Participation in the Large-Enrollment Course”; and Part V, “Alternatives and Supplements to Lectures and Discussion.”

*Hold high but realistic expectations for your students.* Research has shown that an instructor’s expectations have a powerful effect on students’ performance. If you treat your students like motivated, hardworking, and independent learners, they are more likely to behave that way. Try to set standards that are high enough to motivate students to do their best but not so high that students will feel that the goals are beyond their abilities. Students need to believe that meaningful achievement is within their grasp, and they need early opportunities for success. (Sources: American Psychological Association, 1992; Bligh, 2000; Cross, 2001; Forsyth and McMillan, 1991; Lowman, 1995)
Starting the Term on a Positive Note

Tell students what they need to do to succeed in your course. Assure students that they can do well in your course, and tell them what they must do to succeed: “If you can handle the examples in the problem sets, you can pass the exam. People who have trouble with these examples can ask me for extra help.” To a student who is behind, point the way forward: “Here is one way you could go about learning the material. How can I help you?” (Sources: Cashin, 1979; Tiberius, 1999)

Help students set achievable goals for themselves. Encourage students to focus on their continuing improvement, not on their grade on any one test or assignment. Help students evaluate their progress by encouraging them to critique their own work, analyze their strengths, and address their weaknesses. (Sources: Cashin, 1979; Cross, 2001; Forsyth and McMillan, 1991)

Avoid stoking competitive drives. A dash of competitive spirit may motivate some students, but strenuous competition produces anxiety, which can interfere with learning. Set a constructive tone by refraining from public criticism of students’ performance and from comments or activities that pit students against each other.

Maintaining Motivation throughout the Term

Build on students’ strengths and interests. Find out why students enrolled in your course and try to incorporate examples and case studies that relate to students’ interests and experiences. For instance, a chemistry professor might devote some class time to examining the contributions of chemistry to resolving environmental problems. Explain how the content and objectives of your course can help students achieve their educational, professional, or personal goals.

When possible, give students choices. Give students options on term papers or assignments, let them decide between two locations for the field trip, or have them select which topics to explore in greater depth. Choosing among alternatives gives students the opportunity to develop skills in regulating their own learning; planning what to do, setting goals, monitoring their performance, and reflecting on their actions. (Sources: Cashin, 1979; Cross, 2001; Lowman, 1995; Young, 2003)

Increase the difficulty of the material as the semester progresses. Give students opportunities to succeed at the beginning of the semester and then gradually
Motivating Students

increase the level of difficulty. If assignments and exams include easier and harder questions, every student will have a chance to experience success as well as challenge. (Source: Cashin, 1979)

**Vary your teaching methods.** Variety reawakens students’ involvement in the course and their motivation. Break the routine with a session of role playing, debating, brainstorming, field experience, demonstrations, case studies, or a guest speaker.

**Ask students to explore their motivations.** Suggest that students complete an online survey, such as the Motivational Strategies for Learning Questionnaire (MSLQ), developed at the University of Michigan. A short version is available on the University of Arizona Web site: www.ale.arizona.edu/quick_mslq.php. Students receive scores on their goal orientation, beliefs about control, self-efficacy, and other items. (Source: Duncan and McKeachie, 2005)

### De-emphasizing Grades

**Emphasize the intrinsic rewards of learning.** Research shows that motivation is undermined when students are striving for extrinsic rewards, such as grades, rather than intrinsic rewards, which include mastery, self-expression, conquering challenges, personal growth, and meaningful discovery. In addition, students who are motivated by intrinsic rewards tend to process course content at a deeper level, persist longer in learning situations, and show more interest in coursework than students who are motivated by grades. Instructors can stress the personal satisfaction that comes from mastering material and course content, help students measure their progress, and praise and reward students for making good progress. (Sources: Barron and Hulleman, 2006; Brophy, 2004; Covington, 1997; Deci and Ryan, 2002; Lowman, 1995)

**Design tests that encourage the kind of learning you want students to achieve.** Many students will learn whatever is necessary to get the grades they desire. If you base your tests on memorizing details, students will focus on memorizing facts. If your tests stress the synthesis and evaluation of information, students will be motivated to practice those skills when they study. (Source: McKeachie and Svinicki, 2006)

**Avoid using grades as threats.** The threat of low grades may prompt some students to work hard, but other students may resort to academic dishonesty, excuses for late work, and other counterproductive behavior. (Source: McKeachie and Svinicki, 2006)
Offering Feedback and Advice

*Give students feedback as quickly as possible.* Return tests and papers promptly, give students advice on how to improve, and reward success publicly and immediately. Rewards can be as simple as saying a student’s response was good, with an indication of why it was good: “Ling-Chi’s point about pollution really synthesized the ideas we had been discussing.” (Source: Cashin, 1979)

*Use praise judiciously.* Both positive and negative comments influence motivation, but research indicates that students can be particularly affected by specific positive comments. If a student’s performance is weak, offer a comment that expresses your belief in the student’s capacity to improve and succeed over time. Keep your comments focused on the task at hand rather than shifting the student’s attention to self, which can distract from learning. (Sources: Cashin, 1979; Cross, 2001; Shute, 2008)

*Try to cushion negative comments.* Criticism is a very powerful stimulus. When you identify a student’s weakness, make it clear that your comments relate to a particular task or performance, not to the student as a learner or as a person. Offset negative comments with a compliment about aspects of the task in which the student succeeded. Avoid offhand or joking remarks that may hurt students’ feelings. (Source: Cashin, 1979)

*Give feedback to enhance student learning.* A body of research has shown ways that instructors can make feedback more effective (adapted from Shute, 2008):

- Focus on the task, not the learner.
- Provide guidance in manageable chunks so as not to overwhelm students, giving only enough information to help them and no more.
- Give comments in writing rather than in person.
- Emphasize learning rather than performance by acknowledging the role mistakes play in the learning process.
- Avoid normative comparisons with other students.
- Give both immediate feedback (to fix errors in real time) and delayed feedback (to encourage transfer of learning).

**Specific Tasks: Motivating Students to Do the Reading**

*Establish norms early in the term.* On average only about one-third of your students will have completed the reading on any given day. Set expectations and
Motivating Students

hold students accountable for doing the required reading in a timely fashion. If you do not in some way monitor whether students complete the reading, some students will conclude that the reading is of little consequence. (Source: Burchfield and Sappington, 2000)

**Give students guidance on how to read the assignment.** Discuss appropriate reading strategies for your field: how to approach the material, the importance of distinguishing major points from minor details, and so on. Your campus probably has resources to help students develop their critical reading skills; or you can refer students to materials developed at Dartmouth (“Reading Textbooks Effectively”) or Stanford (“Reading Efficacy”), available on the university Web sites by searching for the title. Bean (1996) and Erickson, Peters, and Strommer (2006) also offer tips on helping students get the most from the assigned reading.

**Assign the reading and the study questions at least two sessions in advance.** Give students ample time to prepare, and give them study questions that highlight the key points. Try to pique students’ curiosity about the reading: “This article is one of my favorites, and I’ll be interested to see what you think about it.” (Source: Lowman, 1995)

**Ask students to prepare questions based on the reading.** As class size permits, have students turn in two index cards, each of which contains a question and their name. Randomly redistribute the cards in class and call on a student to read the question from the card, indicate who wrote it, and attempt to answer it; then open the floor to comments from others. (Source: Martin, 2000)

**Give a graded assignment on the reading.** Ask students to prepare written responses to questions you pose about the reading and turn in their responses for credit or for extra credit. (Source: Uskul and Eaton, 2005)

**Allow students to create “survival cards” that they can use during exams.** At the start of each class, a professor in the physical sciences asks students to submit a three-by-five card that contains an outline, definitions, key ideas, or other material from the day’s assigned reading. After class, he checks the cards and stamps them with his name. At a class session before the midterm, he returns the cards to students and allows them to add material, but they cannot submit additional cards. The students hand in their cards, and the professor distributes them to students during the midterm. This faculty member reports that this technique encouraged 90 percent of his students to complete all the reading. Another professor uses five-by-eight cards and gives students one point of extra credit for each card they
submit as well as allowing students to use the cards during the exam. This faculty member reports that about one-third of the class ended up with higher grades as a result. (Sources: Carpenord, 1994; Daniel, 1988)

**Give frequent quizzes.** Quizzes can prompt students to keep up with the reading and motivate students to attend class. In addition, frequent quizzes give students practice in test taking, which helps minimize anxiety and can lead to improved final exam performance. Quizzes also give you and your students a sense of how well they are learning the material and what topics are especially difficult. Students report that they are more likely to do the reading if they expect they will be quizzed. To ameliorate student anxiety about frequent testing, some instructors treat quizzes as opportunities for extra credit. (Sources: Kouyoumdjian, 2004; Marchant, 2002; Narloch et al., 2006; Thorne, 2000)

**Specific Tasks: Motivating Students to Attend Class**

**Be realistic about student attendance.** Student absenteeism is, unfortunately, common across colleges and universities. Research from the early 1990s showed that on any given day about one-third of the enrolled students do not show up for class (Romer, 1993). While there have been no comparable recent studies, faculty anecdotally report that half the class may be absent at various times during the term. Some faculty are deeply pained when students skip class, taking it personally, as a sign of disrespect to the instructor and other students. For them, classroom dynamics, climate, and intellectual exchanges are diminished when significant numbers of students are absent. Other faculty are not particularly bothered by disappearing students and teach enthusiastically to whoever shows up. How you personally feel about student attendance will affect steps you might take to address this issue.

**Understand factors that affect student attendance.** Researchers have surveyed students and identified the variables that appear related to attendance (Brewer and Burgess, 2005; Dolnicar, 2001; Fjortoft, 2005; Friedman et al., 2001; Gump, 2005; Moore, 2005; Rocca, 2003):

- GPA (students with better academic records attended class more regularly)
- elective versus required courses (students in elective courses attend more regularly)
- size of class (the smaller the class, the more likely students are to attend)
Motivating Students

- type of teaching method (attendance tends to be lowest in lecture courses)
- personal qualities of the instructor (students are more likely to attend the classes of instructors they view as “friendly and approachable,” “open to feedback and criticism,” “respectful toward students,” and “knowledgeable about students’ names and interests” according to Friedman et al. (2001)

In contrast, the following factors do not appear to significantly affect attendance: student’s age or year in school, student’s employment status, student’s residence (on or off campus), student’s course load, and schedule of the class (time of day or days of the week). Popular reasons for skipping class include “I had to study for an upcoming test in another class”; “I had to run personal errands”; “I was too tired and needed to sleep”; “I didn’t do the homework”; and “Class is useless.”

**Administer a brief survey to students about their attendance.** If attendance is a concern for you, find out why students skip class by administering a brief online survey (if you administer the questionnaire in class, you will miss those who are absent). Sample questions can be found in Sleigh, Ritzer, and Casey (2002); Friedman, Rodriguez, and McComb (2001); and Woodfield, Jessop, and McMillan (2006).

**Consider whether webcasting and podcasting might affect attendance.** Research to date has provided little evidence that the availability of recorded lectures has any effect on learning outcomes or student performance, but some faculty believe that webcasting and podcasting contribute to student absenteeism. If students can access the same material online, they argue, doesn’t that undermine their motivation to attend class? Working from that premise, some faculty limit their online posting to outlines or notes, saving details and examples for class. Others delay making webcasts or podcasts available for 24 or 48 hours. Students, however, tend to see webcasts as tools for review rather than as a replacement for attending class, although a small number of students indicate the availability of recorded lectures might make them more likely to miss class. (Sources: Deal, 2007; Grabe and Christopherson, 2008)

**Explain the value of attending class.** Share with students the body of research on attendance and academic performance: studies consistently show that students who regularly attend class earn higher course grades than students who regularly miss class. Appeal to students’ sense of responsibility to their peers: students are part of a community of learners and by attending class regularly they can help the community flourish. Some faculty read to students Tom Wayman’s
wonderful poem “Did I Miss Anything?” (www.loc.gov/poetry/180/013.html).
(Sources: Clump et al., 2003; Durden and Ellis, 1995; Gump, 2005; Launius, 1997; Marburger, 2001; Romer, 1993)

**Do not assume that mandating attendance will solve the problem.** Making attendance mandatory is unlikely to help students become self-motivated learners. More effective is the use of active learning strategies, open and engaging interpersonal interactions, and reminders throughout the term about the importance of attendance. Let students know that what happens in class can’t be duplicated elsewhere. Try to make every class a unique, not entirely predictable learning experience. (Sources: Moore, 2005; St. Clair, 1999)

**But take attendance.** The act of taking attendance itself tends to increase the number of students who show up for each class and improves students’ overall academic performance. When you take attendance, let students know that attendance records will not enter into your calculation of students’ grades. (Source: Shimoff and Catania, 2001)

**Experiment with specific incentives for attendance.** Some faculty report success with the following techniques (adapted from POD and PsychTeacher listservs):

- Offer an extra-credit assignment to be completed outside of class on days that attendance is poor; students sign up during class to be allowed to submit the extra-credit assignment.
- Give one or two short for-credit assignments that can be done only in class.
- As class size permits, announce that at the end of the term you will ask each student to name two or three students whose class participation most contributed to their learning, and that students will receive credit for being nominated.
- Let students know the exams will contain material mentioned only in class.
- Give test hints at the end of randomly selected classes and do not let students know when that will be; give these hints after webcasting or podcasting concludes.
- Collect and return homework in class.
- Use personal response systems (“clickers”) to engage students and monitor attendance.
- Ask students to complete two questions at the end of selected sessions and give two or three points of credit:
  - What was the most important thing you learned in class today?
  - What was something new you learned in class today?
  - What questions do you have as a result of today’s class?
• Make some handouts available only in class and not online.
• Capitalize on the social nature of learning by undertaking activities that
students cannot duplicate by viewing the webcast—for example, pair work
or question-and-answer sessions.

But temper your expectations about incentives. Some studies show that cer-
tain individual traits such as conscientiousness influence student attendance more
than incentives. Since conscientiousness is not amenable to external influence,
incentives may have little impact on whether students attend your class. (Source: 
Conrad, 2004)

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Motivating Students

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PsychTeacher listerv: A moderated online community for instructors involved in teaching psychology; see teachpsych.org/news/psychteacher.php
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Informally Assessing Students’ Learning

Rather than waiting to see how students perform on a test, you can use informal methods to ascertain what and how well your students are learning, and you can take advantage of this information to shape further instruction. The techniques described in this chapter, also called “formative assessment” (Shepard, 2006), will help you determine the following information (adapted from National Research Council, 1997):

- what your students know about a topic
- whether students are motivated to learn the material
- whether students have understood the main points you were trying to convey
- whether students are prepared for class
- what problems your students are having with the material

A review of over 250 studies shows conclusively that using formative assessment strategies, and making adjustments in instruction as a result, can significantly improve student learning (Black and Wiliam, 1998).

As you experiment with these techniques, try to find a balance: if you use them too often, students may feel (rightly or wrongly) that these assessments are taking time away from—rather than contributing to—their learning and studying.

Checking Students’ Understanding: Written Responses

Ask students to write a one-minute paper. Davis, Wood, and Wilson (1983) describe a technique developed by UC Berkeley physics professor Charles Schwartz in the late 1970s and popularized by Angelo and Cross (1993). At the end of a class period, ask your students to write for a minute or so on two questions: What is the most significant thing you learned today? and What question is uppermost in your mind at the end of today’s class? These papers, submitted anonymously, will indicate how well you have conveyed the material and how you might structure your presentation for the next class meeting.
Informally Assessing Students’ Learning

A variation used by a Harvard statistics professor asks students, “What was the muddiest point in my lecture today?” Other questions: What was most surprising or unexpected about today’s session? At what point this past week were you most engaged in the class or the material? What is helping you learn in this class? What is making learning difficult?

Some faculty use the minute paper during class in order to stimulate discussion or break up a lecture. Research shows that the use of minute papers enhances students’ performance on exams. (Sources: Angelo, 1991; Angelo and Cross, 1993; Chizmar and Ostrosky, 1998; Davis et al., 1983; Mosteller, 1989; Stead, 2005)

Use reaction cards. In small- or medium-sized classes, distribute index cards to students at the beginning of class and ask them to put their name on the card and to write a comment sometime during the class session. Comments may include responses to questions you pose or a student’s questions or observations about any aspect of the class. Tell the students that you will collect the cards at the end of the hour, write a brief response at the bottom of each card, and return the cards at the next session. Both instructors and students report that reaction cards are useful for identifying content problems and monitoring student learning. (Source: Costello et al., 2002)

Ask students to list key concepts or ideas. At the conclusion of a series of sessions or readings on a topic, ask students to write or post online short phrases summarizing three to five key concepts or main ideas about the topic. Review these lists to verify whether your students have grasped the important ideas. You may want to initiate a class discussion that asks students to compare their entries or to define and apply the concepts. (Source: Angelo and Gross, 1993)

Ask students to give definitions or applications for difficult concepts. During the last ten minutes of class, ask students to complete the following or similar statements:

- As I understand it, the main idea [or concept or point] of today’s session was . . . .
- A good example of an application of this idea is . . . .
- The main point of today’s session was most closely related to the following concepts, processes, events, or things: . . . .
  (Source: Lancaster, 1974)

Ask students to write an exam question. At the end of a unit, ask students to write an exam question (in the format you specify) for extra credit. In addition
to giving you a sense of how well your students understand the material, these test
test questions will also give you ideas for constructing your exams.

Ask students to provide a closing summary. At the end of a session, ask stu-
dents, individually or in pairs, to write a very brief summary of the main ideas
covered in class. Or at the beginning of class, ask students to summarize the main
ideas from the previous class or the reading and to write one question they expect
to be answered during class.

Ask students about the midterm. Append one or two questions to the end of the
midterm or ask students to respond at the next class session to these topics:

- their readiness for the exam
- which test questions were most difficult and why
- what may have prevented them from achieving a higher score
- how well the exam helped them learn the material
- what they plan to do differently in studying for the next exam

Ask students to write a microtheme. A microtheme is a composition that can fit
on a five-by-eight notecard. Some instructors grade these; others duplicate some
of the best to hand out for class discussion. Some suggestions for microtheme
assignments (adapted from Bean et al., 1982):

Summary microtheme. Summarizing an article in a few sentences requires stu-
dents to identify the main and subordinating ideas. Summary microthemes
are particularly useful when the class is studying conflicting views.

Thesis-support microtheme. Ask students to choose one of the alternative prop-
ositions for an issue and to muster facts in support of their position. Two
examples:

- Random portfolio diversification (is/is not) more reliable than selective
diversification.
- Mutual fund performance (is/is not) superior to the average investor’s
performance.

Data-provided microtheme. Present students with a set of data and ask them to
explain changes and trends. For example: Imagine an audience that has
not seen this table. Explain to them the changes in birth and death rates in
the United States in the twenty-first century. Be engaging, informative, and
accurate.

Quandary-posing microtheme. Ask students to explain a given problem to someone
who knows little or nothing about the subject. For example, answer the follow-
ing letter as clearly as you can. If you use physics terms, you must define them.
Informally Assessing Students’ Learning

Dear Dr. Science: My girlfriend and I were at a baseball game and someone hit a pop fly. My girlfriend said that when the ball stopped in midair just before it started back down, its velocity was zero, but its acceleration was not zero. I said she was wrong. If something isn’t moving at all, how could it have any acceleration? Which of us is right?

**Ask students to keep a dynamic list of questions.** As a short homework assignment, ask students to write a list of questions that they hope to be able to answer by the end of the class period. During class, students cross off the questions that are answered and add new questions that arise. At the end of class they turn in their lists, which will give you a snapshot of students’ preparation, learning during the session, and unanswered questions. (Source: George and Cowan, 1999)

**Have students document how they solve a problem.** As part of a homework assignment, ask students to write a short paragraph or two about the method they used to solve a problem. As needed, offer your students pointers about how to clearly explain their process.

### Checking Students’ Understanding: Questions and Discussion

**Ask students whether they are understanding you.** Instead of the generic “Any questions?” ask, “What questions do you have?” If many of your students look puzzled, ask, “Can you tell me where I lost you so that I can go back and find you?” Try to avoid posing questions that put students on the spot (“Who doesn’t understand?”). (Source: National Research Council, 1997)

**Hold a debriefing session.** Reserve the last ten minutes of class for an analysis of the effectiveness of that day’s discussion. Holding a debriefing at the next session after the midterm exam will allow you to probe students’ reactions to the exam questions and the adequacy of their preparation.

**Ask students to “think-pair-share.”** Pose a question, and ask students to think about it (and maybe jot down a few ideas), and then turn to a seat neighbor and share their thoughts. Next, the pairs report their discussion to other pairs and, as size and time permits, to the whole class. (Sources: Maier and Panitz, 1996; Millis and Cottell, 1998)

### Checking Students’ Understanding: Using Technology

**Encourage students to record online their reaction to the day’s session.** Stanford University has developed the “Lecture Gauge” (http://ctl.stanford.edu/Faculty/...
lecture_gauge.html), online questions that ask students to rate how challenging the lecture was, to indicate the most important point, and to identify any hard-to-follow portion of the lecture. Students’ responses are anonymous. Instructors can instantaneously view aggregate data.

**Using a learning management system, design a pre- and post-class assignment or quiz.** Some learning management systems or collaborative and learning environments allow you to design, administer, and score online multiple-choice quizzes, with the results immediately available to you and the students. A pre-quiz on the reading will help students prepare for class. A post-quiz assures that students review what they have learned.

**Conduct instant polling, using clickers.** If your classroom has a wireless system that supports handhelded clickers (electronic personal response systems), you can pose multiple-choice questions during class and have students vote on the answer. The votes will be instantaneously displayed, usually as a bar graph. If student opinion is divided, you can ask students to discuss their answer with their neighbors and revote, or you can call on students who gave different answers and ask them to explain their reasoning.

Because students purchase clickers and pay to register them for specific courses, faculty recommend that you use clickers regularly to make the expense worthwhile. Some systems provide a record of each student’s responses throughout the term. Some faculty give class-participation credit for the percentage of polls to which a student responds (regardless of the correctness of the response).

At some universities, instant polling programs are loaded into students’ mobile phones. Other faculty ask for a show of hands or a display of lettered signs (A, B, C, D) or response cards.

Faculty who use polling strategically, especially clickers, report increased student participation, attendance, learning, knowledge of the views of others, interest, and motivation. Some faculty have restructured their large-enrollment courses to be fully interactive using clickers. (Sources: Caldwell, 2007; Duncan, 2005; Kam and Sommer, 2006; Kellum et al., 2001; Marmolejo et al., 2004; Mehta, 1995; Meltzer and Manivannan, 2002; Nicol and Boyle, 2003; Robertson, 2000)

**Conduct online polling.** Faculty in an introductory biology course posed multiple-choice questions about key concepts on their course Web page. Students selected the best answer and rated their confidence that their answer was correct. Once they submitted their answer, they could view the results: the percentage of students who chose each response and a graph displaying the respondents’ confidence level. Correct answers were not provided until the next class meeting, which served as
an incentive for students to attend. The online questions were not graded, but students received credit for responding. Consider online strategies to probe students’ understanding of course information, provide individualized feedback, and track student performance. (Sources: Brewer, 2004; Hunt and Pellegrino, 2002)

**Implement a just-in-time approach.** Just-in-time teaching allows students to tell you what they know a few hours before coming to class, so that you can structure the session accordingly. The technique requires the instructor to post several short-answer or multiple-choice questions online once a week. Students submit their responses online at least three hours before class, and the instructor uses their responses to prepare for class. During class, selected responses are displayed (correct, partially correct, incorrect) and used to illustrate various points in lecture or discussion. Students’ responses are graded and returned. Researchers report that students enjoy the process and benefit from receiving immediate feedback on their level of understanding. (Sources: Benedict and Anderton, 2004; National Research Council, 2003; Novak et al., 1999)

**Checking Students’ Understanding: Resources**

**Undertake your own simple assessments to ascertain how well your students are learning.** Angelo and Cross (1993) describe a variety of classroom assessment techniques (CATs) that are easy to implement and will give you feedback on how students are learning. They also describe how you can develop your own assessments. For example, the “Background Knowledge Probe” is a short questionnaire given to students at the start of a course to assess their preconceptions about the course content.

**Consult compilations on the Web.** Other sources of informal assessment techniques are presented by FLAG (Field-tested Learning Assessment Guide) at www.flaguide.org; this compilation of faculty-generated strategies for evaluating student learning pertains primarily to courses in science, math, engineering, and technology.

**References**


Informally Assessing Students' Learning


Mobile Learning

Mobile technologies offer a way to create dynamic, interactive learning environments inside and outside the classroom. The current generation of wireless computing and portable communication devices includes laptops/tablets, PDAs (personal digital assistants), mobile phones, digital cameras, MP3 players, iPods, iPhones, small electronic book readers, and various multiple-function devices.

Mobile devices can be used to facilitate quick feedback or reinforcement; deliver interactive demonstrations and quizzes; provide immersive experiences (for example, foreign languages); enrich learning outside the classroom (for example, data collection in the field); and share information (for example, syllabi, assignments, and calendars). Of course, these devices can also interfere with learning when students shop online, send e-mail, or play games during class. Some students may even feel sanguine about missing class if they can view the webcast at their convenience.

General Strategies

Decide how you feel about students using mobile devices in your classroom. Although you may want to banish students who shop on their laptops, send messages on their mobile phones, and engage in other electronic pastimes during class, banning the devices may not be the best solution. You can’t force students to pay attention if they don’t want to. And even if you forbid all electronic gadgets, students will still daydream, whisper, and pass notes. Banning mobile devices may also pose communication problems during emergencies. Nonetheless, some faculty prohibit laptops in the classroom and feel that students are more engaged and involved as a result. Others use software that allows them to see which programs are running on students’ laptops, to block specific applications, and to disable specific laptops. Still other faculty ask students who bring laptops to sit where their screens can be observed. (Sources: Fried, 2008; Young, 2006)

If you permit mobile devices, establish rules of etiquette. Consider asking students at the beginning of the term to set norms for what constitutes respectful classroom use of mobile devices. Or state your policies on your syllabus, and refer to those policies on the first day of class. The following guidelines are adapted...
from Bloom (2007), Efaw, Hampton, Martinez, and Smith (2004), Hembrooke and Gay (2003), Lang (2001), Rubinstein, Meyer, and Evans (2001), and discussions on a UC Berkeley listserv:

- Emphasize that students’ use of electronic devices for purposes not relevant to the course must be kept to an absolute minimum.
- Require students to silence their phones.
- Share research findings on task switching that show that multitasking students learn significantly less and perform on tests more poorly than students who focus solely on classwork.
- Use a simple activity to show how multitasking is less effective than single-tasking: Ask students to count from one to ten, then ask them to recite the letters A through J. Either task takes about five seconds. Next, ask students to switch between the tasks: “A, 1, B, 2, C, 3 . . . ” This takes much longer because of the time required to switch back and forth.
- Ask students to put their screens and devices down during portions of the class session; make exceptions, as needed, for students with disabilities.
- Point out how laptops can distract students seated nearby.
- Ask students using laptops to place them off to the side so that you can maintain eye contact.
- Establish consequences for inappropriate use.
- Design in-class assignments that use laptops or other devices for pairs or small groups; such exercises lessen the chance that students will use their devices inappropriately.
- Walk around the room during class and stand in the back of the room for a time.

Try to anticipate technical challenges. If you will be using mobile technologies in your class, ask the campus technology staff for advice on how to handle problems such as unreliable wireless connections, differences among students’ devices, protection and backup of files, and the like. (Sources: Caudill, 2007; Corbeil and Valdes-Corbeil, 2007; Reeves and Ward, 2005; Rekkedal and Dye, 2007)

Examples of Mobile Learning

Laptops. Faculty have put students’ laptops to work in various ways (Barak et al., 2006; Efaw et al., 2004; Felder and Brent, 2005; Nilson and Weaver, 2005):

- Ask students to share access to information or to find facts online (for example, in a psychology class on sleep deprivation, an instructor asks, “Who holds the
record for most consecutive hours without sleep?” “What are five established symptoms of sleep deprivation?”

- Conduct online searches using the resources of the library or a scholarly Web site.
- Work through problems using spreadsheet software.
- Take online quizzes.
- Conduct experiments in virtual science labs.
- View online images and video clips.
- Solicit anonymous questions from students during class.
- Ask students to produce a graphic simulation of a mathematical process.
- Conduct public chats or private “back channel” text messages that comment about the lecture or demonstration.
- Have students work in small groups that take a position for or against an issue, and post their key points on an online discussion board.

**Podcasts.** Podcasts are digital audio or video programs (sometimes called vodcasts) that can be accessed on mobile devices at the convenience of the listener or viewer. Some campus instructional technology offices maintain directories of podcasts from which instructors can select items appropriate to their course. In addition, instructional podcasts are available at iTunes U and YouTube, where universities have their own pages listing courses, speakers, and events. Instructors with the interest, time, and skills can also create their own podcasts or help students produce podcasts on course-related topics. UCLA and Purdue University offer information on creating podcasts.

Experienced faculty offer the following tips (adapted from Bell et al., 2007; Corbeil and Valdes-Corbeil, 2007; Eisenberg, 2007; Frydenberg, 2006; Staley, 2007):

- Select or create podcasts on the assumption that many students will access the material from a mobile device while they are engaged in another activity (such as commuting, exercising, or doing chores). In other words, assume that students may not be able to follow complex material or take notes.
- Select or create podcasts that provide supplementary materials: interviews with experts, guest speakers, debates, film clips, topical news, and the like.
- Limit the content of a supplementary podcast to a few main themes. As needed, divide topics or presentations into short chunks (10–15 minutes each) and create a series of podcasts from which students may choose the topics that interest them.
- If you are going to produce your own supplementary podcasts, create a weekly summary of the questions asked during office hours, offer a quick preview of the upcoming unit, or present a pre-exam review.
• If you are going to record your entire lecture, take advantage of lecture-capture software that records both words and digital images. Such software indexes words so that students can search for a specific term or point when they replay the lecture.

Cell phones as converged devices. Multiple-function phones can be used to store and manipulate data; take pictures; download music; receive and send text messages and e-mail; access the Internet; show videos; stream live video; video conference; receive and send global-positioning signals; receive alerts about campus safety; replace clickers as classroom response devices; send round-the-clock updates; browse mobile social networks; and conduct class business (find grades, register for classes, add/drop classes, use a content management system). Faculty also use mobile phones to quiz students during class; assign students to take photos on field trips and send the instructor the images in real time; and text message students as appropriate.

No matter how often you ask students to silence their phones, you will hear an occasional ring tone during class. Some instructors impose a penalty (the offending student has to provide snacks for the class at the next session), and others use the interruption as an opportunity to review and interact with students, asking “Who can summarize the previous point?” or “What’s the last thing you wrote down in your notes?” (Sources: Bloom, 2007; Campbell, 2006; Fischman, 2007)

References


