ONLINE TEACHING AT ITS BEST

Merging Instructional Design with Teaching and Learning Research

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CHAPTER 6

Developing Interactivity, Social Connections, and Community

This chapter addresses one set of high-impact practices over which faculty have complete control: student-instructor, student-content, and student-student interaction. It opens with a review of the literature on the effects of these interactions. Next we show how online technologies, used wisely, can foster interactivity, social connectedness, and community in online courses, starting with student-instructor interaction. Of the three types of interaction, this one makes the biggest difference in student success. Student-content interaction encompasses various media presentations, discussion formats, group work, interactive technologies, study aids, and connections with subject librarians. Meaningful student-student interactions can involve discussions, collaboration, peer review, or group work on any of several whole-class and small-group communication platforms. One final type of student interaction is with the technology, and in this section we will focus on your best uses of the learning management system, course management strategies, the meaning of contact hours in online courses, and ways to determine and boost student engagement.

The forcing of interaction can be as strong a detriment to effective learning [as is] its absence.
—M. Simonson (2000)

THE EFFECTS OF INTERACTIONS ON LEARNING

For several decades, we have known the value of student interactions with the instructor, the course content, classmates, and technology in online courses (Anderson, 2003; Educause Learning Initiative, 2005; Moore, 1989; Moore, 2014; Reisetter & Boris, 2009; Rhode, 2009; Simonson, 2000; Sorensen & Baylen, 2009;

Wang, Chen, & Anderson, 2014; Wanstreet, 2009). When these interactions develop instructor, cognitive, and social presence, they help students feel part of a community, which sustains their persistence in online courses (Angelino, Williams, & Natvig, 2007; Estes, 2016; Luyegu, 2016; Semingson & Smith, 2016). Online students vary in their desired degree of community, and researchers vary in how they define it, yet across the board, well-designed interactions keep students from feeling the sense of isolation that often leads them to withdraw (Drouin & Vartanian, 2008).

In a face-to-face classroom, interactions usually occur spontaneously, but in an online class, you must design productive interactions in advance. Student interactions with content and the instructor matter most. The principles for good practice in undergraduate education offer strategies for building high-quality interactions in an online course (Chickering & Ehrmann, 1996; Chickering & Gamson, 1987; Sorensen & Baylen, 2009; Zhang & Walls, 2009):

- Student-faculty contact, such as e-mail communications, online discussions, student conferences, and sharing introductions at the start of a course
- Student reciprocity and cooperation, such as study group discussion areas, group problem solving, and project teams
- Active learning through assignments, such as research projects, simulations, and creating relevant deliverables
- Prompt feedback on learning, such as automated feedback on quizzes or practice tests and instructor feedback on ways to improve student work
- Time on task, such as recommending time spent on an assignment and underscoring student commitment to schedules and steady progress in the class
- Communication of high expectations, such as explaining requirements, assigning significant real-life problems, and giving clear criteria for grading of assignments
- Opportunities for students to express their diverse talents and ways of learning, such as encouraging self-reflection, providing choices for projects, and allowing different ways of fulfilling assignments

In online learning, we also focus on student interactions specifically with the instructor, content, fellow students, and technology. Getting the balance of these interactions right, aligned with learning outcomes and student interests, yields the following benefits (Anderson, 2003; Angelino, Williams, & Natvig, 2007; Croxton, 2014; Drouin & Vartanian, 2008; Estes, 2016; E. Moore, 1989; J. Moore, 2014; Reisetter & Boris, 2009; Simonson, 2000; Sorensen & Baylen, 2009; Wang, Chen, & Anderson, 2014; Wanstreet, 2009; Zhang & Walls, 2009):

- Creates teaching, cognitive, and social presence
- Develops a feeling of community
- Raises student engagement and satisfaction with online learning
- Improves student learning
- Increases student persistence and retention (reduces withdrawals)

Online students are more willing to minimize interactions with other students (Morris, 2016), but planning for some student-student interactions such as a study buddy in the class can foster informal social connections (Madland & Richards, 2016). Not all interactions need to be formally structured or graded, as students like room for informal interaction too (Rhode, 2009). Build in some space for them, such as open-topic discussion areas, a student lounge, informal blogs, or a social media forum.

In practice, the types of interactions overlap. For example, familiarity with the content prepares students for reflections, critical thinking, teamwork, assignments, discussions, and tests. Morris (2016) identifies some of the most interactive technologies, including messages to students that invite a reply, construction of discussion forums with meaningful problems and questions, collaboration tools such as wikis and blogs, social media such as Facebook and Twitter, website building tools such as Ning, and labs and interactive homework tools. For determining how to use such tools, make sure to invite, if not require, meaningful student interactions (Dixson, 2010) and consider the following steps for planning (Hirumi, 2009):

- Identify the essential experiences for achieving your goals and learning outcomes.
- Use a research-based instructional strategy suitable for your students.
- Organize and describe how each interactive event will be used during the course.
- Define the type of interaction, and plan both the quality and the quantity expected.
- Select the tools for interactions, such as e-mail, chat, discussion board, or other technologies.
- Review and analyze the appropriateness of your planned interactions, and revise them to make improvements.

Finally, specify technologies that are easy to use, at least after you provide or direct students to some training. Students value the quality and type of interactions more than the quantity or the variety of technology tools. Focusing on a required number of responses in a discussion rather than quality can actually decrease student participation (Jeong, 2014). So can failure to furnish clear guidelines for participation, give feedback, explain criteria for evaluating participation, and ensure that students can work with the courseware and technology (Zheng & Smaldino, 2009). Thus, be sure to let pedagogy drive your technology choices and your interaction design, and do not overload your students with either too much technology or too many interactions (Hirumi, 2009).

In the following sections, we explore what we know about effective strategies for student-instructor, student-content, and student-student interactions.

STUDENT-INSTRUCTOR INTERACTION

Research studies show that student-instructor interactions produce positive outcomes and matter more than other kinds of interactions (Battalio, 2009; Cho & Cho, 2014; J. Moore, 2014; Thurmond & Wambach, 2004). But contrived interactions can do more harm than good (Sorensen & Baylen, 2011; Thurmond & Wambach, 2004). Interactions must have a clear purpose and hold value for students. Do they clarify meaning, deepen student understanding, or encourage and support the student? Factors that contribute to quality include these:

- A visible instructor presence and a well-prepared course (Liu, Magjuka, Bonk, & Lee, 2009; Tsiotakis & Jimoyiannis, 2016)
- Organization of content, clarity of your directions, provision of examples of exemplary work, and timely feedback (Estes, 2016)
- Appropriate use of communication tools (Pavlis-Korres & Leftheriotou, 2016)
- Frequent and personalized interactions (Thurmond & Wambach, 2004)

Some interactions can be formally organized and others informally. For example, an online office within the course allows questions and answers about course schedules, changes in due dates, directions for assignments, and other general course issues. A personal introduction and course orientation video add to personal presence. Virtual office hours (usually held weekly) do the same. The telephone, e-mail, or conferencing tools also have a role.

These research findings on online learning may also apply to others who have a role in your course such as a teaching assistant or subject-area librarian, and they parallel related principles of learning from cognitive science (see chapter 4). Exhibit 6.1 lists guidelines based on these findings for setting communication tone and style, with an emphasis on early scaffolding for course communications.

Exhibit 6.1: Communication Tone and Style

- Create a safe, low-stress, supportive, welcoming environment.
- Set the tone for the style of communication you expect.
- Express clear communication policies from the outset, including expected netiquette protocols.
- Share your professional background, your interest in the course content, and your enthusiasm about teaching it.
- Communicate the personal relevance of the material.
- From the outset, send students a positive, motivating message. Let them know that you care about their welfare, their success in your course, and their opinions about how the course is going.
- Show sensitivity to cultural diversity. For example, use gender-neutral language and deal appropriately with sensitive and controversial issues.
- Send periodic motivating messages in announcements or e-mails.
- Respond quickly to offensive communication and signs of harassment early on. If you find insulting comments, unfounded attacks on student work or ideas, or netiquette violations such as "flaming," privately counsel offenders in an e-mail, phone call, or other technology, such as FaceTime or Skype. If you decide to remove the student's comments, explain why, or move them to a private discussion forum or journal area.
- If an offender does not cooperate, enforce consequences as stated in your syllabus and in your institution's policies against harassment.

Visible presence goes beyond a preliminary introduction. Gaining a sense of your personality mat ters to students (Reisetter & Boris, 2009). It is a good idea to include a link to your home web page c vita and respond to frequently asked questions in a personalized way. Students care about your knowl edge, helpfulness, response time, encouragement, support for their time management, and expectations c quality work. After all, students do change their approach to learning when they understand the natu of the task (Stöter, Zawacki-Richter, & von Prümmer, 2014). They need the same kinds of routines the experience in face-to-face classes (Estes, 2016). For example, a beginning-of-the-week introductor conversational e-mail message such as "Welcome to Week 1," "Welcome to Week 2," and so on, can giv students a quick overview of your expectations for the week. A list of learning activities in a week or module folder supplies a convenient checklist of their progress. A weekly wrap-up message can pu together students' contributions, highlighting how they relate to the past week's content and concepts well as the next week's.

Like the scaffolding that supports construction, timely scaffolding in an online course saves students time and effort and actively supports their success. It should help students learn not only the content but also organizational and time management strategies, ways to succeed, and institutional resources for trouble-shooting technology problems, writing papers, and resolving other course-related issues (Liu & Kaye, 2016; Sorenson & Baylen, 2009). Students drop out when the reality of the academic demands of online learning clashes with their prior misconceptions of online learning being easier than classroom (Zawacki-Richter & Anderson, 2014). They usually hold jobs and often have parenting demands and need the time flexibility that online courses allow (Ertmer et al., 2007; Pavlis-Korres & Leftheriotou, 2016; Woods, 2016). Early frequent contact can get students on track and reduce future interaction workload (Angelino et al., 2007; Estes, 2016).

Without feedback, students can feel disconnected from the course (Ertmer et al., 2007). If they do not get quick feedback, many will send repeated e-mails asking for it (Sorensen & Baylen, 2011). Timely responses cut back on those kinds of e-mails, keep students more engaged in learning, and guide them in how to improve. So give timely, meaningful, positive, nonthreatening, and constructive feedback to students on their assignments, e-mails, postings, and tests to scaffold their learning (Sorensen & Baylen, 2011; Grandzol & Grandzol, 2006; Kelly, 2014). Common time frames for feedback include forty-eight hours for e-mails and a week for assignments, but they may vary with the type of assignment and schedule changes.

In discussions, formative feedback informs students where they hit the mark and what requires improvement (Knowlton, 2009). For example, Michelle Drouin e-mails her students privately right after their first and subsequent academic discussion (Drouin & Van Gorder, 2015). She prepares ahead of time the messages that she will send to the top performer, the bottom performer, and those in between and then adapts each message to the quality of each student's posting. In this way, top performers receive affirmation that they are on track, and the bottom and in-between performers receive guidance on what to do to improve their future posts. For quizzes and tests, you usually can preset automated feedback in the learning management system (LMS) for correct and incorrect responses, or use flash cards and crossword puzzles where students can self-check their responses on their own.

Exhibit 6.2 provides recommendations for providing feedback to students based on principles of learning from cognitive science (see also chapter 4).

Exhibit 6.2: Instructor Feedback to Students

- Give feedback through multiple technology channels.
- Preload feedback for quizzes and tests for correct and incorrect answers and set the timing for delivery to the students. What you write in the feedback for correct versus incorrect answers will guide the students in their learning. You can set up reflective feedback for free-response quizzes, too, such as, "If your answer includes _____, then you are on track. If you left out any of these, then review _____."
- Praise effort, and guide students on how to close the gap between current and desired performance.
- For essays and papers, concentrate on major writing issues such as content, reasoning, and organization and less on style and grammar. You may need to provide further clarification and examples of desired products. Consider making a follow-up assignment in which students paraphrase or summarize your feedback back to you.
- When giving feedback in discussion forums, use your messages to stimulate further discussion and guide student thinking. Stick with the role of facilitator, and avoid dominating the discussion. Too many of your words can shut down the students' words.

Prompt students to self-assess their responsiveness, participation, and performance. Reverse the feedback loop by asking students to formatively evaluate the course design and teaching. Their feedback carries tremendous value, especially when launching a course for the first time. You gain insight from their perspective into what works well, what does not work so well, and what they would want to change in some way. (You need not make every change they ask for, but do explain why you will not make it.) In addition, it is another way for you to interact with them. Questionnaires, surveys, discussion forums, and reflective logs can help collect student feedback (Goodson, 2004c). Limit options to those that guarantee students' anonymity. For a new course, check the web pulse between the third and the sixth weeks. Ask questions as simple as, "What do you like most?" "What do you like least?" and "What would you change?" Or solicit students' perceptions about and reactions to what they are learning.

STUDENT-CONTENT INTERACTION

Interaction with content paves the way for successful learning (Liu & Kaye, 2016; Sadik & Reisman, 2009), and some evidence indicates it is as important as, or more important than, student-instructor interaction (Ekwunife-Orakwue & Teng, 2014; Ramos & Yudko, 2008; Zimmerman, 2012). But students place a high value on their time and will not access content that they think they do not need (Murray, Pérez, Geist, & Hedrick, 2013). The LMS offers many pathways to a content source, but a single, clear path works best (see chapter 3). Students' interaction with content through various technologies (e.g., publisher online materials, an e-textbook, discussion forums, or other online software) needs to be clean and lean, or they will be less likely to use it. Strategic selection of content to keep content lean will allow more time for meaningful interactions. Content must be relevant, accurate, useful, and complete enough to address the learning outcomes in the course, and no more (Murray et al., 2013). If certain content does not map directly onto the outcomes, leave it out.

Content Guidance for Students

While students themselves must interact with and process the content, they need guidance—for example (Reisetter & Boris, 2009; Sadik & Reisman, 2009):

- A chance to browse and see the organization of the lesson or module before tackling it
- Explicit expectations for what they have to learn how to do with the content
- A readable and understandable textbook
- Links to previous related lessons or materials
- Interactive visuals
- Access to relevant library materials
- Links to supplemental information available within a lesson or weekly folder rather than outside the folder
- Automated feedback in interactive practice sessions and quizzes to inform them of their progress

The following example illustrates the implementation of most of these strategies. For her nutrition course at Purdue University Fort Wayne, Linda Lolkus selected a quality textbook with interactive, visually

rich publisher materials that provided automated feedback, followed by a discussion allowing for additional feedback. She aligned student learning activities with the textbook structure (Goodson, 2016b), as illustrated in one of the study guides:

READ IT
- Access and read Chapter 2 of your textbook.
- Review the learning objectives for the chapter.
- Review the *Top Ten Points to Remember.*

SEE IT
- Nutrition Animations
- Review *Overview of Digestion and Absorption.*

STUDY IT
- Review Study Guide for Chapter 3.

DO IT
- NutriTools
- Review *Build a Sandwich* then complete *Build a Sandwich Assignment.*
- Review *Digestion and Absorption* then complete the *Overview of Digestion and Absorption Assignment.*

DISCUSS IT
- Complete Week 2A *Probiotics* discussion.

Lolkus gave her students the choice of using the print textbook or the e-textbook of *MyNutritionLab* with *MyDietAnalysis*. She gave details on each edition (author, title, ISBN) and the option for purchasing only the access code for the lab if a student preferred to buy a used textbook. Both textbook formats were well designed to engage students in highly relevant active learning for achieving the course outcomes.

Other possible activities that foster content interaction include virtual labs and field trips, role playing, problem and project-based learning, debates, expert panels, structured discussions, writing assignments, and website building (Sorenson & Baylen, 2009). We list online resources for some of these activities in the "Web Resources for Content Interaction" section in this chapter.

The following conditions also support student interactions with content (Helms et al., 2011; Murray et al., 2013; Rourke & Lewer-Fletcher, 2016; Thurmond & Wambach, 2004).

- Ongoing interactions with the content such as just-in-time content for certain assignments or discussions rather than large chunks of content dumping
- Consistent course content structure, similarity of format for content presentation, and simple access to content
- Enough time for students to study the content before asking them to use it
- Explicit alignment of content with learning outcomes to make its purpose and value clear to students
- Opportunities for analysis and critical thinking about content, as in reflective journals and analyses of the blog postings of others
- Points or grades for recalling and using content, such as a graded quiz, discussion, or assignment

Content Presentation

Interactive content presentation encompasses various media representations, interactive technologies, carefully chosen social media, study aids, and connections with subject librarians. A straight presentation, no matter how beautiful, is not an interaction, and students can easily turn it off or skip it. Make your short lectures interactive by interspersing student activities and holding students accountable for completing them by showing or submitting some kind of work. When students must do research, try to embed a link to the library and the librarian for your specialty area so they have easy, convenient access to the materials they will need and scheduled appointments with the librarian.

Exhibit 6.3 shows the best strategies for content presentation based on the principles of learning from cognitive science (see also chapter 4).

Exhibit 6.3: Content Presentation and Interactions

- Present online content cleanly and simply in whatever medium you use. Get right to the point, and do not elaborate more than is necessary. Highlight the main points, and avoid extraneous audio, graphics, and text.
- To reduce cognitive load, reduce the number of pieces of new information by collapsing them into categories or logical groups; also see chapter 3 on coherence. Whenever possible, try to help your students categorize material.
- Build a complex lesson in shorter segments rather than as one long, continuous lesson.
- Launch new topics with a graphic organizer of their sequenced components. (See the "Visuals and Media" section in this chapter.)
- For the content files you build, use headings and subheadings to organize content.
- For readings, avoid assigning too much text at one time.
- Model procedures or methods you want students to use, such as in a video or podcast.
- Show students examples of exemplary and unacceptable student work.
- Explain abstract content with practical examples.
- Encourage positive emotions about the content by finding ways to display enthusiasm and drama.
- Use stories and examples, such as illustrative anecdotes, case studies, and problem-based learning. Include different contexts, conditions, disciplines, and levels of abstraction to help students arrive at the most robust and useful generalizations and conclusions.
- Show students worked examples (problem solutions) to start and only partially worked examples as they progress.
- When choosing the textbook, whether print or electronic, evaluate the quality of content, the fit to your learning outcomes, the ease of use, the format and layout, and the quality of interactivity. Personally verify a publisher's marketing claims for the functionality and ease of use.

Visuals and Media

Following the principles of learning from cognitive science (see chapter 4), present content and have students interact with it in more than one modality whenever appropriate. Students value and learn more from engaging, media-rich content presentations (Brewer & Brewer, 2015; Clark & Mayer, 2011). However,

keep in mind that "media mix is not mind rich" (Mayer & Clark, 2013), and often less is more. Kilburn, Henckell, and Starrett (2016) provide examples of productive ways to use images and media:

- Short text posts, such as status updates (twitter.com, blogger.com, edublogs.org, classblogmeister.com)
- Long text messages, such as reports, research, papers, or reflections (mediawiki.org, facebook.com, wordpress.com)
- Photos, such as those of field trips, live research, or depictions of topics of study (flickr.com, instagram .com, facebook.com, pinterest.com)
- Video, such as short clips from a smartphone or camera (youtube.com, vimeo.com, vine.co, instagram.com)
- Audio, such as recordings of a talk, interview, or podcast (audioboom.com)
- Portfolios, such as those to display one's work for future employers (linkedin.com)

Images enliven content and enhance immediate learning as well as long-term memory (Nilson, 2007). Create your own or use images from your library or free image collections such as these:

- EveryStockPhoto: http://www.everystockphoto.com/
- PublicDomainPictures: http://www.publicdomainpictures.net/
- Free Images: http://www.freeimages.co.uk/
- Free Images: http://www.freeimages.com/
- 4Free Photos: http://4freephotos.com/
- Free Digital Photos: http://www.freedigitalphotos.net/
- Public Domain: http://www.public-domain-photos.com/
- Flckr Creative Commons: https://www.flickr.com/creativecommons/

Videos are also powerful learning tools when you give students opportunities to engage with them. Make your own videos, or pull them from your library or other sources such as YouTube (E. Moore, 2013). Here are some activities to make them active learning vehicles:

- Distribute questions for students to answer before, during, and after the viewing.
- Use a video to present a controversy for a discussion in which students must choose a position and explain their reasoning.
- Provide links to multiple videos, and have students compare their strengths and weaknesses or choose one for analysis.
- Send students on a web hunt for videos to support different points of view and post them with annotations on a class or group discussion forum.

Many course materials with dynamic student-content interactions are readily available. For example, college algebra courses use plenty of open educational resources (OERs) (Hilton, Gaudet, Clark, Robinson, & Wiley, 2013). (You can read about the OER university and their creators at https://oeru.org/.) These course materials include tutorials, quizzes, audio and video materials, images, lessons, textbooks, scenarios and case studies, software, games, animations, and maps—for example:

- Introductory Algebra: Open Educational Resource Project, Fall 2015: https://sccmath.wordpress.com /mat09x-fall-2015/
- MAT12x—Intermediate Algebra, Spring 2015, Open Educational Resource Project: https://sccmath .wordpress.com/mat12x-fall-2014/

- Arithmetic, Algebra, and Trigonometry, Open Educational Resource Materials: https://sccmath.wordpress.com/oers16/
- Internet Mathematics Assessment System (homework delivery and automatic grading): http://www.imathas.com/
- Arithmetic and Algebra Workbooks and Exams: https://sccmath.wordpress.com/

The last section of this chapter lists other OERs available for free in different disciplines.

Exhibit 6.4 furnishes guidelines for using visuals and media based on the principles of learning from cognitive science (see also chapter 4).

Exhibit 6.4: Visuals and Media

- Do not rely only on text-based presentations and readings. Instead, find or create media, varying them among videos, audio, graphics, and text. Give students the opportunities to process your online content in at least two or three modalities involving multiple senses. Allow them to read, hear, talk, write, see, draw, think, act, and feel new material, involving as many parts of the brain in their learning as you can. Look for what can engage students emotionally as well as cognitively. (Accessibility guidelines require you to make text material available in both audio and text formats as well as visual whenever possible; see chapter 7.)
- Display graphics (e.g., pictures, photographs, diagrams, flowcharts, animations, videos, concept maps, mind maps) as much as possible to illustrate phenomena, principles, examples, processes, procedures, and causal and conceptual relationships. Accompany them with relevant labels and descriptions.
- Avoid dense text in slides. Reserve slides for what the students need to see, such as pictures, photographs, diagrams, flowcharts, and other visuals. Use relevant and interesting images.
- Explain graphics with audio narration or written text but not both. Encourage students to either listen to the audio recording or read the text, but not both at the same time. (Make both formats available.)
- Create or find presentations with a visible speaker using an informal, conversational style.
- In your personal recordings, vary your facial expressions, vocal intonations, speaking pace, and movements as far as the technology allows.
- Produce videos or podcasts of your lectures in short installments, and select similarly short presentations from other sources (students view up to six minutes), reserving longer ones for powerful, authentic, and professional videos (such as TED Talks, which run no more than eighteen minutes).

Content Misconceptions

Faulty mental models interfere with learning because, as "prior knowledge," they cannot accommodate the correct content. Many instructors face the challenge of convincing students to give up their misconceptions and replace them with valid models. Exhibit 6.5 recommends ways to help them get past those faulty mental models in consonance with the principles of learning from cognitive science (see chapter 4).

Exhibit 6.5: Faulty Mental Models

- If you do not know your students' mental models of your content, find out. For example, ask about how they think some phenomenon emerges or works, or give them a multiple-choice test with distracters that reflect possible or likely misconceptions.
- Once you know your students' faulty mental models, explain or demonstrate how your discipline's models provide better explanations. Help students question their misconceptions with demonstrations, animation, videos, and simulations. Integrate challenges to create impasses in their current mental models—that is, contradictions, conflicts, anomalies, uncertainties, and ambiguities, which in turn stimulate curiosity, inquiry, questioning, problem solving, and deep reasoning to restore "cognitive equilibrium." Give students opportunities to test out their misconceptions against your discipline's models.
- Once you know that your students have a valid mental model, relate new knowledge to it as much as possible.

Content Practice

Teaching involves not only presenting content but also giving students practice working with it. Some kinds of practice are more effective than others (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013):

- *Highly effective:* practice testing and distributed (spaced) practice
- *Moderately effective:* elaborative interrogation, self-explanation, and interleaved practice
- *Modestly effective:* writing of summaries from text, highlighting or underlining the text while reading, associating key words and images as aids to remembering the text, rereading text

Incorporating the highly and moderately effective techniques into student-content interactions should advance student learning across platforms:

- *Practice testing:* Self-testing or taking practice tests over new material. *Examples:* Free-recall-based self-testing, flash cards, low-stakes pop quizzes, open- or closed-book retrieval of information, free or cued recall, short-answer questions, multiple-choice inference-based questions, and practice testing with feedback.
- *Distributed (spaced) practice:* Following a schedule of practice that spreads out study activities over time. *Examples:* Multiple repetitions after initial learning, opportunities to go beyond recall to deeper, conceptual levels of learning.
- *Elaborative interrogation:* Generating an explanation for why a stated fact or concept is valid. *Examples:* Why does it make sense that . . . ? Why is this true?
- *Self-explanation:* Explaining how new information is related to known information or explaining the steps taken during problem solving. *Example:* Explain what the sentence means to you. That is, what new information does the sentence contain for you? And how does it relate to what you already know?
- *Interleaved practice:* Following a schedule of practice that integrates previously learned material with new material (e.g., "old" problems with new ones) in a single study session; alternating practice on different kinds of problems.

In another type of practice, students reflect on and self-assess their learning. This has high impact when it prompts students to think critically about their learning process (Nilson, 2013). It also supports the student's cognitive presence, which is so important in an online course (Luyegu, 2016). Since most students are unfamiliar with reflection, providing criteria for and models of what you expect will improve results. Use course tools such as journals and practice tests, or make productive use of microblogging tools such as Twitter, Jaikku, Tumblr, MySay, Hictu, and Edmodo (Kilburn et al., 2016).

Exhibit 6.6 lists ways to build effective practice into course activities based on the principles of learning from cognitive science (see chapter 4).

Exhibit 6.6: Practice Activities

- Give quizzes and exams as often as you can. Taking a test is a powerful form of practice (Karpicke & Roediger, 2008) that helps students evaluate their learning progress and become self-regulating (Nilson, 2013; Soderstrom & Bjork, 2014).
- Integrate the right level of challenge into practice activities. When students have to work harder to learn material, they generate multiple retrieval paths and stretch their abilities. Asking students to take a quiz, solve "old" problems along with new ones, generate explanations, or relate new to previously learned knowledge supply that challenge.
- Ask reflective free-response questions, such as, "What is the most important thing you learned?" or, "What is the most surprising?"
- Ask students to describe their preparation, process, or steps for doing assignments.
- After a simulation or role play, ask students to describe and evaluate their goals, decisions, strategies, and responses to the actions of other students. Grade their analyses pass/fail with nominal points for passing.
- Give students informal opportunities for self-assessment, such as flash cards or crossword puzzles with answer keys in Respondus (http://www.respondus.com/).
- Give step-by-step hints and feedback to guide students' early practice.
- Create opportunities for reflective writing about a topic's importance, deeper meaning, and connection to what students already know or believe to be true. Collect and give feedback on student responses.
- Have students review and retrieve previously learned content at spaced intervals and in the process of learning new material.
- Guide students in retrieval practice. Have them read, listen to, or watch the assignment, then free-recall as much as they can by writing it down or reciting it aloud, and finally review the assignment to find what they forgot, missed, or recalled incorrectly.
- Give students the opportunity to correct their errors and redo the problem or exercise.

Content Discussions

While you may think of discussion forums as only a student-to-student interaction format—and they are indeed a major focus of the next section on student-student interaction—they can also engage students in the content. You just need to set up clear expectations from the beginning that students will have to supply sound evidence and reasoning for their claims (Brewer & Brewer, 2015; Gilbert & Dabbagh, 2005; Helms

et al., 2011; Woods, 2016). You can guide them by asking the following types of questions to advance their thinking (MacKnight, 2000):

- *Clarification:* "Would you put it another way? "Would you give an example?"
- *Query about initial question or topic:* "What does this question assume?"
- *Probe assumptions:* "What could we assume instead?" "Why do you think the assumption holds here?"
- *Probe reasons and evidence:* "What are the reasons for your position?" "What is the evidence to support your claim?"
- *Probe origin or source:* "Where did you get this idea?" "What caused you to feel this way?"
- *Probe implications and consequences:* "If this is the case, what else must be true?" "What would be the effects?"
- *Probe viewpoints or perspectives:* "What is an alternative opinion?" "How would other groups of people respond? Why?" "What would someone who disagrees say?"

Content Assessments

Chapter 3 addressed assessment in depth, so our treatment of the topic here will be brief. Assessments should indeed be a learning experience for students in which they interact with the content. Of course, when you assess students' mastery of content, you are really interested in assessing what students can *do* with it. This doing is built into the learning outcomes. Before you design a test or assignment, review the learning outcomes because they should dictate your assessments. As we stated in chapter 3, if you want your students to be able to do X, Y, and Z, assess their ability to do X, Y, and Z. Therefore, at least some of the questions and tasks in your assessments should require explanatory, inferential, analytical, evaluative, or creative thinking depending on the course outcomes.

Consider having students develop high-level thinking questions on a reading, video, or other content presentation. Teach them the higher-level cognitive operations, and show them model questions. When they know you might use them on a quiz or test or fashion them into an assignment or discussion prompt, they will be motivated to submit good questions.

Exhibit 6.7 lists best practices for effective assessments based on the principles of learning from cognitive science (see chapter 4).

Exhibit 6.7: Effective Assessment

- Plan on giving a comprehensive final integrative assignment or exam, and tell your students from the beginning that you will do so. This strategy will discourage students from forgetting the content you presented earlier in the course.
- Provide plenty of assessment opportunities, including low-stakes quizzes and exams, practice tests, and homework assignments that can tell students how much they are really learning and give them retrieval practice.
- Ask students to explain what the content means on a deeper level and why it is important.
- For the most important material, create test questions that require free recall, such as short-answer items, essay questions, and problems to solve. But ask students to do more than just recall. Ask them to do whatever your learning outcomes specify they should be able to do with the content. Tell

students in advance what material merits short answers, essays, complete problem solutions, and the like so they will study accordingly.
- Make assessment criteria explicit and specific. Delineate what a student product should accomplish, what elements it should contain, and what questions it should answer. Furnish them with models of excellent, fair, and unacceptable work. You might set up a discussion forum to allow students to ask about the criteria and models you provide.
- Remind students to space their pre-exam study sessions over several days and get a good night's sleep the night before a test instead of cramming.
- For assessing group work, have some kind of peer performance evaluation in which students assess their own contributions as well as those of their teammates. (See chapter 3.)

Design one or two assignments to take advantage of available technology—for example (adapted from Kirsner, Teem, & Underwood, 2011; Pérez & Hurysz, 2011; Stowell, 2011; Yandell & Bailey, 2011):

- Invite students to review existing wikis, edit existing articles, post new ones to a wiki site, create wikis with the tool built into your LMS, or with Wikispaces: http://www.wikispaces.com/
- Create your own podcasts; then have students create their own podcasts using a free audio recorder and editor such as Audacity: https://sourceforge.net/projects/audacity/
- Submit podcasts to the iTunes directory for your course; also see Apple's podcast resources: http://www.apple.com/podcasting
- Have students find relevant videos using search tools such as:
  - Google video: http://video.google.com/
  - YouTube: https://www.youtube.com/
- Select and assign screencasts (recordings of activities on computer screen, often with audio added) with tools such as these:
  - Screencast.com: http://www.screencast.com/
  - Mathcasts: http://www.mathcasts.org/
  - Create your own screencasts to highlight content, address concepts or problems, show demonstrations, or answer student questions. Students generally enjoy screencasts and find them helpful. Follow up with written assignments in which students explain what they learned from the screencasts.
- Have students create blogs on the content with tools such as these:
  - Blogger: http://www.blogger.com
  - Wordpress: http://www.wordpress.com
- Design an assignment, possibly a group assignment, that makes use of Google Docs, sheets, or slides: https://support.google.com/docs/answer/49008?hl=en
- Create and send students on a competitive knowledge hunt, scavenger hunt, treasure hunt, or webquest: http://www.webquest.org/
- Select a cluster of websites to prompt students to write an analysis or reflection on an issue related to the content.
- Have students use search engines to find and analyze blogs related to the content such as Find Blogs: http://www.findblogs.com/

- Assign simulations that assess students' facility applying the content, such as PHET at University of Colorado: https://phet.colorado.edu/en/simulations/category/physics/
- Give digital photography or video assignments in which students can show their ability to apply or demonstrate the content, and store their photographs on sites such as Flickr: http://www.flickr.com/
- Have students design concept maps using tools such as these:
  - Inspiration: http://www.inspiration.com/Inspiration/ (modestly priced)
  - Bubbl.us: http://www.bubbl.us/ (free)
- Guide students in creating their personal websites that link to content-relevant sites with tools such as MyYahoo: https://my.yahoo.com

For more ideas, explore these:

- Edutools: http://www.edu-tools.info/
- Google tools: http://www.google.com/about/products/
- Google Hangouts: https://hangouts.google.com/
- teachweb2.0: http://teachweb2.wikispaces.com/

Web Resources for Content Interaction

Whether for content presentations, visuals, media, practice, or assignments, the web offers an amazing array of free digital teaching and learning resources. This section and Shank (2014) list those of exceptional value. The following types of resources are available:

- Course materials, including podcasts and videos of lectures
- Realistic demonstrations, animated or on video
- Performances (musical, dramatic, dance, and sport)
- Virtual science laboratories for hazardous or costly procedures and experiments
- Virtual field trips
- Case studies and problem-based learning problems
- Simulations for many subjects (e.g., business, management, history, sociology, urban planning, political science, environmental studies, and biology)
- Science, technology, engineering, and mathematics (STEM) problems for students to solve
- Drills and exercises for remediation, practice, or review (e.g., mathematics, reading, and foreign languages)
- Teacher resources for K–12 and special education (presentations, exercises, and other activities)
- Tests of greater or lesser validity on temperament and personality, aptitudes, career preferences, political ideology, leadership style, team member style, and other human dimensions, many free
- Multimedia materials useful for research

Instructional Podcasts, Videos, and Text Materials

Below are some free instructional resources, the first few for podcasts and the rest for videos and text:

- iTunes: https://itunes.apple.com/us/genre/podcasts/id26?mt=2/
- iTunesU—thousands of podcasts of varying length on hundreds of subject: https://itunes.apple.com/us/genre/itunes-u/id40000000?mt=10/

- Learn Out Loud—a podcast search tool: http://www.learnoutloud.com/
- American Rhetoric—hundreds of speeches mainly from real-world politics and movies: http://www.americanrhetoric.com/
- Anneberg Media—specializing in the arts, literature, language, history, math, social and natural sciences: http://www.learner.org/
- Artbabble—specializing in art and architecture: http://www.artbabble.org/partner/national-gallery-art-washington/
- Khan Academy—over three thousand lessons, mostly in the STEM fields: http://www.khanacademy.org/
- MITOpenCourseware—lectures and materials from over twenty-two hundred courses: https://ocw.mit.edu/index.htm
- Online Books Page—free access to over 2 million books: http://www.digital.library.upenn.edu/books/
- OpenYale—lectures and materials from selected introductory courses: http://oyc.yale.edu/
- TED Talks—many hundreds of highly polished lectures of about twenty minutes or less on a wide range of subjects: http://www.ted.com/
- TEDEd—TED talks with short lessons ("flips"): http://ed.ted.com/
- Videolectures—full-length faculty lectures on many subjects at http://videolectures.net/
- YouTube sites:
  - YouTube Home: https://www.youtube.com/
  - YouTube EDU: http://www.youtube.com/edu/
  - TeacherTube: http://www.teachertube.com/
  - Utubersity—lessons, lectures, sports, media broadcasts, interviews, and performances (musical, dance, opera, drama, and comedy): http://utubersidad.com/en/
  - YouTube CrashCourse—fifteen- to eighteen-minute videos on physics, astronomy, anatomy and physiology, economics, philosophy, literature, history, political science, and computer games: https://www.youtube.com/user/crashcourse/videos/
- Access to free textbooks in every major academic and professional disciplines at these sites:
  - Open-Course Library, Creative Commons—free to download and edit: http://opencourselibrary.org/
  - Open Textbook Content: http://www.collegeopentextbooks.org/textbook-listings/
  - Open Education Consortium: http://www.openedconsortium.org/
  - Open Stax: http://openstaxcollege.org/books/
  - Open Stax small modules: http://cnx.org/
  - Open Stax CNS Library: https://cnx.org/browse
  - Open Textbook Library: http://open.umn.edu/opentextbooks/
  - Saylor Academy Open Textbooks: http://www.saylor.org/books/
  - Open Culture, cultural and educational media: http://www.openculture.com/free_textbooks/
  - BookBoon: http://www.bookboon.com/
  - The Global Text Project: http://globaltext.terry.uga.edu/books/
  - IOER Research Search: http://ioer.ilsharedlearning.org/search/

Multimedia Research Collections

Your institution may have a library collection of multimedia materials or licensed access to such collections, such as Artstor. In addition, here are some extensive cross-disciplinary collections of well-established,

research-worthy multimedia sites that you can use for lesson planning and send your students to use:

- Calisphere—a huge collection of websites, scholarly materials, images, electronic books, data, and statistics: https://calisphere.org/
- Creative Common CC Search—a searchable collection of millions of images, music, and videos: http://search.creativecommons.org/
- CSERDA Metadata Catalog—a searchable repository of web-based teaching materials for mathematics, computer science, and the sciences: http://www.shodor.org/refdesk/Catalog/
- Google Custom Search (University Learning=OCW+OER=Free): https://cse.google.com/cse/home?cx=009190243792682903990:e40rcqv1bbo
- Internet Archive—millions of websites, software, and digitized cultural artifacts (images, audio files, animations); also courses, study guides, assignments, books, and recorded lectures under Education (aka the WayBack Machine): https://archive.org/
- Lumen Learning—access to almost sixty academic online courses: https://courses.lumenlearning.com/catalog/lumen/
- MERLOT (Multimedia Educational Resource for Learning and Online Teaching)—tens of thousands of annotated links to free learning materials, most of them peer reviewed, including entire courses, databases, presentations, and collections: http://www.merlot.org/
- National Science Foundation Internet Library—rich and technologically sophisticated instructional materials for the sciences, engineering, mathematics, public health, economics, and other fields: https://nsdl.oercommons.org/
- Open Learning Initiative—access to over two dozen online courses and course materials in a wide range of academic fields: http://oli.cmu.edu/
- New York Public Library Digital Collections—a vast collection of culturally significant images, audio files, videos, print and audio books, articles, maps, DVDs, menus, and research-worthy databases and archives: http://www.nypl.org/collections/
- Notre Dame University's OpenCourseWare—lecture transcripts, syllabi, and other instructional materials in history and the social sciences: http://online.nd.edu/ocw/
- Smithsonian Institution—virtual access to the world's largest museum (actually over a dozen museums), nine research centers, and the National Zoo: http://www.si.edu/
- Temoa OER Portal—hundreds of thousands of online educational materials of all types in all subjects: http://www.temoa.info/
- The Valley of the Shadow—primary sources (letters, diaries, census and government records, newspapers, and speeches) documenting the lives of Northerners and Southerners in two counties during the Civil War and Reconstruction eras: http://valley.lib.virginia.edu/

Learning Objects

These are self-contained, reusable digital lessons on specific topics, the best of which are animated, interactive, and truly multimedia. Students can learn on their own and at their own pace by playing or running them any number of times. Both faculty and students perceive learning objects to be powerful teaching and learning tools (Ip, Morrison, & Currie, 2001; Moore, 2003–2004; Shank, 2014), and one study reports that they most benefit students who need the most help (Biktimirov & Nilson, 2007).

Learning objects are housed in open learning object repositories, many of them searchable by discipline. In some cases, you must join an online community, but this entails no cost. The last one listed even provides annotated links to additional repositories:

- MERLOT (Multimedia Educational Resource for Learning and Online Teaching)—many thousands of interactive case studies, simulations, games, and animations for every discipline: http://www.merlot.org/
- OER (Open Educational Resources) Commons—close to thirty thousand materials, many interactive and animated, for college level and above (much more for K–12) for every discipline: http://www.oercommons.org/
- JORUM—close to twenty thousand materials, many interactive and animated, for college-level and continuing education, almost all unique to this site: http://www.jorum.ac.uk/
- Brock University—twenty high-quality simulations, games, animations, and exercises for English, finance, German, management, mathematics, and psychology: http://www.brocku.ca/learningobjects/flash_content/
- University of Wisconsin, Milwaukee Center for International Education—learning objects for global studies and a few more for the social sciences, plus an annotated listing of dozens of learning object repositories across the disciplines: https://www4.uwm.edu/cie/learning_objects.cfm?gid=47

Websites for STEM Activities

STEM disciplines often require laboratory and problem-solving experiences that are difficult to transfer to the online environment. The sites listed here offer the best virtual alternatives:

Physics

- PhET—physics simulations at Colorado University: https://phet.colorado.edu/
- AP Physics site by Delores Gende with links to many virtual labs: http://apphysicsb.homestead.com/
- Technology Enabled Active Learning (TEAL), MIT iCampus: https://icampus.mit.edu/projects/teal/
- Online Labs in Physics: http://onlinelabs.in/physics

Chemistry

- Resources to Teach and Learn Chemistry: http://www.chemcollective.org/
- Online Labs in Chemistry: http://onlinelabs.in/chemistry
- Chemistry Education Applets, University of California: http://www.chem.uci.edu/undergrad/applets/

Biology

- Biointeractive Virtual Labs: http://www.hhmi.org/biointeractive/explore-virtual-labs
- Online Labs in Biology: http://onlinelabs.in/biology
- McGraw-Hill Biology Lab: http://www.mhhe.com/biosci/genbio/virtual_labs_2K8/
- General Biology Labs, Rutgers: http://bio.rutgers.edu/~gb102/virtuallabs_102.html
- The Virtual Biology Labs, Rutgers: http://bio.rutgers.edu

- Pearson, The Biology Place: http://www.phschool.com/science/biology_place/labbench/
- The Molecular Workbench Database: http://workbench.concord.org/database/

Zoology

- iExploreSTEM: Zoology Activities: https://iexplorestem.org/zoology-activities

Human Anatomy

- Online Labs in Anatomy: http://onlinelabs.in/anatomy/
- NOVA Map of the Human Heart: http://www.pbs.org/wgbh/nova/body/map-human-heart.html

Geography

- Make Your Own Virtual Field Trip: http://www.nmgeoed.org/google-earth-virtual-field-trips.html
- Discovery Education Virtual Field Trips: http://www.discoveryeducation.com/Events/virtual-field-trips/explore/
- Virtual Field Trips, iLearn Technology: http://ilearntechnology.com/?tag=virtual-field-trips

Geology

- Online Learning Labs in Geology: http://onlinelabs.in/geology

Engineering

- Virtual Lab, Johns Hopkins University: http://pages.jh.edu/~virtlab/virtlab.html
- UVA Virtual Lab Website: http://www.virlab.virginia.edu/VL/contents.htm

Statistics

- Random: Probability, Mathematical Statistics, Stochastic Processes: http://www.math.uah.edu/stat/
- Rice Virtual Lab in Statistics: http://onlinestatbook.com/rvls.html

Multidisciplinary STEM sites

- Planet Seed: https://www.pinterest.com/pin/559432203486482 76/
- MERLOT: https://www.merlot.org/merlot/index.htm
- Virtual Laboratory, Colorado: http://virtuallaboratory.colorado.edu/
- Interactive Experiments, University of Oregon: http://jersey.uoregon.edu/
- Interactivate, Shodar: http://www.shodor.org/interactivate/
- SERC Pedagogy in Action: http://serc.carleton.edu/sp/library/pogil/examples.html
- Instructor's guide to POGIL (Process Oriented Guided Inquiry Learning): http://www.pogil.org/resources/implementation/instructors-guide/

STUDENT-STUDENT INTERACTION

Meaningful student-student interactions can involve sharing, discussion, debate, collaboration, peer review, or peer instruction on any of several whole-class or small-group communication platforms. These interactions and the sense of class community do not depend on whether communication is asynchronous, as in discussion forums, or synchronous, as with chats and videoconferencing (Liu et al., 2009; Orellana, 2009). Factors that *do* make a difference are (Cho & Cho, 2014; Sadik & Reisman, 2009; Zheng & Smaldino, 2009):

- Students' preparation for the interaction
- Number of respectable responses to the questions
- Guidelines for participation
- Alignment of the activity with the learning outcomes
- Clarity of deadlines for posting
- Stability of the technology

To help students develop their own learning community, encourage them to post personal profiles, meet and greet in an online café, reflect on and evaluate their discussions, create their own special interest and study groups, and participate in group projects that require use of content and negotiation. Shallow interactions do not support such community (Ertmer et al., 2007; Liu et al., 2009; Peterson, 2016). Online students in small groups develop more sociability, commitment, and closeness to classmates (Akcaoglu & Lee, 2016), so consider dividing large classes into smaller groups (Peterson, 2016). A "study buddy" strategy also works well (Madland & Richards, 2016). In addition, make thoughtful use of technologies within and outside the course LMS, such as GoogleDocs, wikis, blogs, and Twitter, to promote a sense of online community (Abdelmalak, 2015). Such tools allow students to benefit from others' perspectives.

The rest of this section examines the various forms of student-student interaction and how best to set them up and, where appropriate, grade them.

Peer Review

Peer review can deepen learning and help students improve their work when you follow these recommendations (Ertmer et al., 2007):

- Explain how the peer review process works and why it is worthwhile.
- Give models and examples of effective feedback.
- Provide guidelines on how to give clear, constructive feedback, such as giving positive feedback first.
- Ensure that the peer review process is easy to use.

In chapter 3 we mentioned a few more guidelines for effective peer review and will elaborate here. Do not ask students to actually evaluate each other's work the way we evaluate it. They are uncomfortable doing this as well as ill equipped because they have not yet acquired professional judgment. In addition, their attempts at evaluation tend to be too brief and disconnected from the author's text. Rather, ask students to analyze or react to their peers' work: to find the thesis statement, the evidence, and the main conclusion, or to identify the "strongest sentence," a particularly persuasive piece of evidence, and a sentence or two that the reviewer had to read more than once to understand. The responses provide the author with the most

useful information possible: how the reviewers received and experienced the piece of work. If they did not pick out the intended thesis statement or conclusion, the author then realizes the need to communicate more clearly (Nilson, 2003). At the same time, the author does not feel criticized or discredited.

Class Discussions

The purpose of discussion is to generate a fruitful, constructive exchange of different ideas and points of view, all backed by an argument or evidence and leading to a decision, judgment, recommendation, or solution. Therefore, the questions should be open-ended and have multiple respectable answers. To motivate sufficient student participation in an online discussion, Helms et al. (2011) suggest these strategies:

- Create unique topics across the course.
- Create topics relevant to assignments, such as discussing ideas for upcoming papers.
- Make it easy and clear for students to get into the discussion area and make their contributions.
- Make only some of the postings compulsory.
- Provide detailed instructions and exemplars of productive contributions.
- Develop and use clear, simple rubrics to grade the quality of contributions. One criterion should be posting contributions by your deadline.
- Facilitate the discussion to guide it, but avoid prominence.
- Show that you welcome open debate on any relevant contributions, even if they are controversial.
- Set up a system for responsible critique of contributions.
- For some discussions, require students to work together.

Here are some additional ways to get students to participate. Give them enough lead time to familiarize themselves with the content needed for the discussion. Ask them to give examples of concepts from their own experiences or examples from people they know. In this way, they add to the repertoire of examples. Give them a topic, and ask them to generate questions about it, requiring that no student duplicate any question already asked. Or assign only certain students to ask questions and others to answer. A student who asks a question becomes the leader of the discussion, offers resources such as web links, and at the end of the week gives the summary of the discussion (Sorensen & Baylen, 2011). Other students may send private e-mails with their personal reflections. Or require all students to answer at least one question with evidence added. Whether any of these strategies make sense depends on your purpose.

For one or more discussions, you can develop an expert panel for your course. Recruit a few colleagues and enroll them in a special discussion forum for two to three weeks (Bonk, 2013). Have students complete the appropriate readings, videos, or podcasts and discuss some of the issues in advance. Then have them prepare questions for the visiting experts. Afterward, post a summary of the important issues in the discussion. Veronika Ospina-Kammera used this technique in her course, Family Violence across the Lifespan (Goodson, 2004a). She posted six forums to capture important themes from a panel discussion for her students to review. Alternatively, you can have students identify and post such themes. Or set up the guest speakers' visit for a single session and use a conferencing tool that allows recording of the session to make it available for students in future semesters (Bonk, 2013).

To sustain discussions, direct students' attention as necessary to earlier relevant messages or current events (Ghadirian, Ayub, Bakar, & Hassanzadeh, 2016). In addition, encourage students to express themselves (Ross et al., 2013), summarize the discussion, and add knowledge resources to advance further

reflection and learning (Hirumi, 2009; Liu et al., 2009). You may need to guide the interactions to better support problem solving and critical thinking (Kolloff, 2011). Without guidance and the right amount of intellectual challenge, students are more likely to engage in shallow discussions (Ramos & Yudko, 2008). But keep in mind that too much instructor presence will diminish student interactions.

To encourage deep learning, questions should require students to connect content and concepts beyond simple factual responses (Leflay & Groves, 2013). For example, Lolkus wanted her students to connect their discussion to the preparation activities she had assigned for the following week (Goodson, 2016b):

> Week 2A Probiotics Discussion
>
> *WHAT TO DO:* Click the title link above (*Week 2A Probiotics*). Then click the *Directions* "Thread." After selecting *Directions*, scroll down to view the directions. Click *Reply* and then post your answers to the discussion questions.
>
> *DUE:* No later than 11:59 PM July 8. Postings after the deadline will not be counted.

After following those directions, students would then see the following directions:

> Week 2A Probiotics Directions Thread
>
> *Probiotics: Do You Need Them?* Probiotics are live microorganisms, usually bacteria, mainly found in cultured dairy foods. Some research indicates that probiotics can have health benefits. However, the research is not conclusive, and some experts feel adding probiotics to the diet is ineffective at best and possibly harmful at worst. Should you seek out fortified yogurt or probiotic supplements, or can you get along fine without them? Read the arguments in the textbook, then consider the critical thinking questions and decide for yourself.
>
> 1. Which is the most compelling argument for taking probiotics?
> 2. Which is the most compelling reason not to take them?
> 3. Do you think we know enough about probiotics to recommend them to the public? (Adapted from Blake, 2012)

In the classroom you may or may not grade discussions, but giving some points for online posts recognizes student effort and contributions. You may not want to require and rely on just the number of postings and replies. Instead, craft guidelines to focus student attention on what quality means (Abawajy, 2012; Jeong, 2014; Ramos & Yudko, 2008). For example, Jeong (2004) integrates self-reflection by requiring students to label the type of messages they post and allowing them to return at any time to correct errors in their labels. Jeong uses these symbols:

\+ = support for a claim or statement

– = opposition to a claim or statement

ARG# = one argument (only one)

EXPL = additional support, clarification, elaboration

BUT = question or challenge to logic, validity, accuracy, plausibility

EVID = proof or evidence for validity of a claim, argument, or challenge

In deciding what to grade, consider whether an activity is something you would also grade in a face-to-face classroom. This can help determine whether to give just a few points or assign only "complete" or "incomplete" status, or whether an activity should be graded at all. For example, students' recording of notes in a journal area makes sense, especially if dealing with potentially sensitive issues, but they may merit only a few points when completed each week.

An efficient way to grade students' contributions to discussion is a participation portfolio (Division of Information Technology, University of Maryland Baltimore County, 2013), which has worked very well across the disciplines. At the beginning of the course, post a rubric defining quality contributions and replies; the web contains dozens of them. Students submit examples (specify how many) of their highest-quality contributions or replies every two to four weeks and "grade" them as a whole. Then accepting, raising, or lowering the grade and assessing student participation takes a fraction of the time that it would take to evaluate every post. (For more detailed instructions and a demonstration, go to http://doit.umbc.edu/itnm/managing-discussions/.)

To assess how far a discussion advances students' understanding of the content, you can ask them to post at the end of a discussion their answers to reflective questions like these (Herman & Nilson, in press): What are your five major take-aways from the discussion? What new or deeper understanding of the content did you gain from the discussion? How would you evaluate the quality of the contributions in general? What about your contributions specifically?

Group Work

Group discussions and projects work best when you make explicit what actions you expect from the members and the whole group (Wang, Chen, & Anderson, 2014); students will follow where you lead them. For group discussions, tell students what you want them to do. Do you want them to illustrate or apply concepts? Do you want them to connect the material to local issues, use reasoning, apply rules, solve problems, or make logical, evidence-based decisions? Guide them in finding their way through your topics and questions.

A simple group discussion requires very little setup on your part. But when you assemble groups for projects, you need to plan group membership, define group roles, incorporate individual and group accountability measures, and develop a strategy for assigning individual grades (Hirumi, 2009; McLaren, 2009; Sorensen & Baylen, 2011), including a peer performance evaluation process (see chapter 3).

When setting up teams or groups, try to build heterogeneity into each group. Members can vary on academic background, relevant skills, or points of view depending on the group task. Consider giving meaningful names or having team members name themselves (such as Four Girls and a Guy, Insomniacs, Green Beans, Thinkers, Seekers). Give each team member a specific role to start out (such as leader, encourager, critic, summarizer, or reporter), and let the group rotate roles weekly. Allocate discussion space for the groups to develop their own rules for interaction and responsibilities. Make sure the project is challenging enough to demand synergy among the group members, and carefully specify the product you expect from them (Goodson, 2004a; Heo, Lim, & Kim, 2010).

For example, in her organizational leadership course at Purdue University Fort Wayne, Anna Gibson places her students in leadership roles in the discussion forums (Goodson, 2016a):

> Discussion leaders need to sign up during Modules 01 and 02 and select the module they would like to lead for their team. The discussion topics for each module may be current leadership issues, required readings, or an assigned case study for the current module. Alternatively, the forum leader may choose the topic.

Current leadership issues: Using current news, choose a leadership concept that is related to the topic covered during the current module. The discussion should be on a leader/manager and the current situation that appeared in the news (e.g., print, television, radio, internet, etc.) within the last six months. Sources you might draw from include, but are not limited to: *Bloomberg Businessweek, The Economist, Fortune, Forbes, Black Enterprise, Wall Street Journal, New York Times*, CNN, etc.

Required Readings: Video(s) assignments or readings should be used to guide forum discussions.

Case study: Case studies assigned in the current module should be used to guide forum discussions.

Forum leader's choice: If no case study is assigned for the module, the forum leader may choose the topic.

Forum participant: When you are a discussion forum participant and someone else is the leader of your group, you are to contribute a minimum of one meaningful response within your assigned team (Skidmark, Smoove Move, or White Shadow) discussion forum.

- The forum participation points will be assessed starting with Module 03, January 24, 2015, 8:01 p.m.
- Forum discussions are the equivalent to classroom discussions and are a critical part of the online learning experience.
- Active forum participation will be one measure of your ability to lead, effectively communicate, make and communicate sound decisions, and contribute to everyone's learning.
- The forum discussions close on Saturdays at 8:00 p.m. You will not be able to post additional discussions for the module.

Similarly, think about the purpose of team projects to decide how to set up the group space. If you want teams to work "in secret" to produce, for example, competing designs, give each group a private discussion space. If you want teams to share, set up threads in whole-class discussion forums. For example, you can have a forum titled "Research Ethics" and set up separate threads for each group but with the same purpose and directions:

Forum: Research Ethics

Threads:

- Team 1 Area
- Team 2 Area
- Team 3 Area
- Team 4 Area

Or you could designate subtopics for each team—for example:

Forum: Research Ethics

Threads:

- Team 1 Tuskegee Case
- Team 2 Nuremberg Code
- Team 3 Thalidomide
- Team 4 Stanley Milgram

As long as the task is challenging, you can give all kinds of assignments to groups, such as a complex case study analysis or a fuzzy problem to solve. Give all the groups the same case or problem, or distribute different ones across the groups. If you choose the latter, consider what layers of interaction will most benefit the class. Where do you want each group to record its summary or conclusions, and what kinds of review and comments do you want each group to give to the other? Or do you want them to follow a rotation, such as having team 4 review team 1, team 1 review team 2, team 2 review team 3, and team 3 review team 4? Such a rotation can shift for the next team assignment. Just make sure to align your choices with a learning outcome; do not have students review each other's work just for the sake of review.

Another approach is to assign roles for different members to play in analyzing and interpreting a case, such as Investigator, Patient, Family Member of a Patient, or Institutional Review Board. In the case of an international economic conflict, each group member could represent a different country's perspective. At the local level, as in a case about water pollution, the roles may include Commissioner, Parent of Ill Child, Grant Funding Agency, and so on. To prepare for their roles, individual students should conduct scholarly research reviews, provide citations, and include the reasoning for their perspectives. This strategy builds individual accountability within the group process.

In his Media Legalities Course at Florida State University, Pat Hadley privately made his own list of hot topics for possible team investigations, but he also used the first week of class to invite students to develop and submit their own lists. He then distributed a complete blended list from which students could choose initial research topics (Goodson, 2004b). Similarly, you may invite students to pose questions to investigate.

Discussion forums also can provide space for a well-structured debate that fosters critical analysis and evaluation. Set up opposing teams on an issue for which students individually conduct and write up research to send to their team members before they all discuss the issue and possible sides. You might require each student to submit three articles, an abstract for each, a correct citation, and a position statement on the issue. Then direct students to discuss their findings within their team, reach a consensus, and post their team's position statement. This activity can occur over several weeks in preparation for final team debates. Here are sample directions that explain the activity's purpose and grading criteria (Goodson, 2004b, p. 103):

> *Purpose*: You will be one of three to five students in an assigned team. Individually and as a group, you are assigned a topic or issue of controversy. Your purpose is to prepare for online debates with your classmates. All of these controversy topics will be related to issues you have been preparing for the whole term, so you should be able to articulate positions and counter-positions using sound reasoning, logic, and evidence. . . .
>
> *Grading*: Points will be awarded based on the quality of the presentations made this week and the following week. These are the criteria for quality:
>
> *Clearly stated position*
> - Argument or response, using sound reasoning
> - Supporting evidence from readings or resources
> - Analysis of issues that explains your position on the controversy
> - Courteous and professional communication style
> - Compliance with debate instructions
>
> You have individual and team responsibilities, and the quality of your work and participation as an individual and as a team member will influence your grade. You must complete a form evaluating the level of participation of each individual member.

For determining individual grades based on major projects, consider peer performance evaluations in which each group member assesses her or his own and the others' contributions, distributes points among the members, or gives them ratings. Chapter 3 explains your options.

INTERACTIONS WITH TECHNOLOGY

As with any other access, being able to open a door allows passage into a room. Students who do not know how to open the door will have trouble. For this reason, a number of colleges and universities provide students with the opportunity to self-assess their readiness for online learning. Requirements include daily access to a computer, connection to the Internet, and technology skills such as keyboarding, use of browsers, e-mail, file management, and downloading and running of software that may be needed in a course. Inexperience with such technologies may be frustrating and inconvenient, but an orientation can help students quickly pick up enough skills to make it through a course (Ekwunife-Orakwue & Teng, 2014; Liu & Kaye, 2016; Thurmond & Wambach, 2004). Students also benefit from just-in-time reminders of how to operate technology, like how to submit an assignment in the LMS or how to enter a discussion. Lack of access to a computer and the Internet is a more serious matter that can force students to quickly drop a course.

Five areas or tools in the LMS play a particularly important role in fostering student interactions (Sorensen & Baylen, 2011, p. 73):

- *Announcement space:* brief instructor messages to students such as reminders, additional resources, class schedule changes
- *Question and answer space:* like a virtual office where students can ask for clarifications or assistance (Online Office, Ask the Prof, News 'n' Notes, or other name)
- *Content discussion space:* areas with topics and questions for students to discuss or private journal space (time limited, such as weekly; graded or ungraded)
- *Social space:* an area for informal student-student interactions that you might entitle the Student Lounge, Cybercafé, Coffee Shop, Water Cooler, Venn Den (math course), or Jazz Lounge (music course)
- *Team space:* areas for small-group discussions (ungraded or graded)

Time and student workload do not transfer easily from a classroom to an online course. The student workload and contact hours should be equivalent to those in an on-the-ground course. But in a face-to-face course, contact hours means face time with the instructor in the classroom, typically forty-five hours for a three-credit course, plus two to three times as many hours for out-of-class readings, studying, and other assignments. In an online class, you might count the contact hours as the time it takes students to view a lecture or video or listen to a podcast, as well as take notes and participate in discussions. Students will need your help with time management, and you can give it in the form of organizational strategies, online calendars, file management tips, reminder announcements and e-mails, and periodic checkpoints on their progress (Sorensen & Baylen, 2009).

For the teaching workload, the question is how much time the different types of student-instructor interactions will demand. Planning many one-on-one interactions creates a heavy load. The following practices can help (Mandernach, Holbeck, & Cross, 2016):

- Complete all the basic course components before the course launch date.
- Integrate resources into the course for online guidance, technical support, writing, tutoring, and academic advising, as well as links to the library and subject matter librarian.

- Prebuild a personal introduction and orientation to the course.
- Use a consistent format and structure for course materials and expectations (e.g., assignments always due on Wednesday by 11:59 p.m.).
- Make deliberate use of technology for a particular purpose, and limit supplemental technology.
- Prebuild all quizzes, tests, and self-checks (e.g., flash cards), making use of automated feedback features.
- Develop alternative learning activities and assessments so that students can select those of greatest individual interest.
- Develop your own instructor's manual for the course with documents that will save you time while teaching—for example, concept maps to guide students' interaction with the content, just-in-time resources some of your students may need, and feedback banks or templates for replying to different student situations.
- Create an automated way to solicit anonymous feedback from your students on their learning and course design, such as surveys or polls with scheduled release dates.
- Set priorities for teaching tasks versus grading tasks.
- Create clear boundaries. For example, set and enforce definite due dates, and redirect individual e-mails to your online office when the issue relates to the whole class. Create a repository of course announcements, sets of questions and answers, and anticipated summaries of discussions that you can later customize.
- Create your own templates for e-mails and redundant questions.

Mandernach et al. (2016) also recommend time management and technology tools to support different functions:

- Time management: electronic to-do lists such as Tasks in Microsoft Office or Reminders in Apple
- Short messages: screen-capture apps for recording messages such as screencast-o-matic.com or techsmith.com/jing-features
- Personalized mini-lessons with tools such as creately.com or sliderocket.com
- Communication tools in addition to what might be in your LMS: wimba.com, voicethread.com, powwownow.com, skype.com, and join.me
- Blog and miniblog tools: wordpress.com and twitter.com
- Wiki applications: wiki.com, pbworks.com, and wikispaces.com
- Social networking: facebook.com, linkedin.com, ning.com, myspace.com, and pinterest.com
- Digital repositories: door.sourceforge.net/, Ariadne-cms.org, and trac.cnx.org, as well as many other education areas

Finally, because we know that active participation in the course influences student performance (Coldwell, Craig, Paterson, & Mustard, 2008), take advantage of student tracking and grading tools in your LMS. For example, the Evaluation tool in the Control Panel of Blackboard Learn offers a choice of reports on the frequency of student participation in different course areas. The Performance Dashboard view of Users shows who has made it into the course site, when, and how often. Such tools provide early alerts to send inquiries and encouraging messages to the slow starters. This kind of early intervention can put students on the right track and let them know that the course is not just an inhuman computer-managed system.

Reflections

For Instructors

- How do you want to create your initial online presence? What links to information about yourself do you want to make available to your students? Where in your course site do you want to post these links? In what stages do you want to reveal your online presence? What persona do you want to express? What style of communication do you want to use?
- Looking back over your course map and the planning you have done so far for your course, what content or exercises could you reduce to leave more time for interactions?
- Are others going to provide support for your course? If so, what strategy do you and they want to use for establishing and sustaining their presence in the course?
- What response times do you want to set for different types of communication and assignments from your students?
- What materials do you want to place in your instructor's manual to save you future time in responding to students?
- If students send you e-mails concerning issues of interest to the class, how will you redirect them to your reply in your virtual online office?
- What name and personality do you want to give your virtual online office? The name "Online Office" is fine, but you may be able to give it a more inviting or colorful label.
- What name and personality do you want to give your students' social space? The name "Online Café" is fine, but consider a more creative name like "Firefly Café" or one related to your subject matter like "Green Room."
- In what ways can you interact with your online students without getting into a deep time sink?
- What kinds of practice exercises, quizzes, or tests can you build ahead of time with automated feedback for your students?
- What are your highest priorities for student-content interactions, and how can you implement them?
- What are your highest priorities for student-student interactions in your course, and how can you implement them?
- How and when do you want to ask students for feedback about how the course is going?

For Instructional Designers

- What models or templates can you provide to help the instructor establish an online presence? If the instructor has little professional and personal content to share, what places and stages for revealing an online presence can you recommend?
- What perspectives can you share about the "overstuffed" versus the "lean-and-targeted" content planned so far? What other resources can you direct the instructor to consider to accomplish the same goals with less material or a lighter student workload?
- How can you help others involved in the course, such as a librarian and teaching assistants, develop a presence in the course?
- What kinds of preplanned responses do you think might be useful for anticipated student questions?
- For the materials to go into the instructor's manual, what templates or examples might you suggest?
- What potential time sinks do you see in the planned grading and interactions that may require too much time or take away from appropriate interactions?
- What kinds of practice exercises, quizzes, or tests can the instructor build ahead of time with automated feedback?

- For formative student feedback, what templates or items can you recommend? How can you adapt them to accommodate the instructor's interests in knowing what is working well for the students and what is not?

For Administrators

- Where can resources be visibly posted and readily available to support faculty in their student-instructor, student-content, and student-student interactions?
- What interface with the specialty librarian can be integrated into the online course sites?
- What policies guide the role of support staff such as the librarian and teaching assistants in ensuring an online course goes well for the students and the instructor? If no such policies exist, who can be recruited to create them?

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