Praise for *Online Teaching at Its Best, 2nd Edition*

*Online Teaching at Its Best* is meticulously researched and organized. The authors demonstrate their decades of experience on every page. You can read straight through, as I did, or target your focus on the areas of teaching online that are most important to you. If you want to design engaging courses that help heighten motivation and deepen learning, this book is an excellent resource from start to finish.

—Bonni Stachowiak, Host and Producer, *Teaching in Higher Ed Podcast*, Author of *The Productive Online and Offline Professor: A Practical Guide*, Dean of Teaching & Learning, Vanguard University, Professor of Business & Management

This is a necessary read for anyone who wants to do online teaching well during the COVID pandemic and beyond. Online education is no longer a nice-to-have option; it has become a critical component in modern education. This book offers a structured approach to transitioning from traditional curriculum design to building systems that lead students to meaningful destinations.

—Kathryn L. Neel, Principal, Mcgyver Labs, (an EdTech company)

Faculty facing the complexities of teaching in today’s online environments need practical strategies for all formats—remote, hybrid, hyflex, and fully asynchronous—that are based solidly in scholarly research. Nilson and Goodson deliver exactly that in this thorough yet accessible and easy-to-reference resource. With its comprehensive review of both the instructional design and the teaching and learning literatures, and its planning checklists, charts, and multidisciplinary examples, this book is sure to be a well-thumbed manual for all who teach.

—Flower Darby, Faculty, Instructional Designer, and Lead Author, *Small Teaching Online: Applying Learning Science in Online Classes*

This book answers so many of the questions that faculty are asking right now. The second edition of *Online Teaching at Its Best* is the perfect blend of research, pedagogy, and instructional design for the post-COVID era. Nilson and Goodson provide feasible best practices and real-world examples for a range of online teaching contexts. Higher education faculty, instructional designers, and administrators will appreciate the depth and breadth of the text and the many ways the information in this book can be used to increase online success for teachers and students.

—Diane Marks, PhD, Senior Instructional Designer, Department of Digital Learning, Florida Gulf Coast University

Faculty from all content areas designing, refining, or implementing a remote, hyflex, hybrid, or fully online course and their students will benefit from the practical suggestions based on cognitive research and the principles of effective teaching found in the second edition of *Online Teaching at Its Best*.

—Laurie Pendleton, Executive Director of Curriculum and Assessment, ACUE (the Association of College and University Educators)

This book is a comprehensive resource for those looking to design and deliver courses in the remote, hybrid, hyflex, or fully online environment. The combination of research-based principles and practical resources offer guidance for those seeking to design courses from the ground up as well as those who are looking to further develop their online teaching.

—Dr. Jennifer Boman, Associate Professor and Faculty Development Consultant, Mount Royal University
ONLINE TEACHING
AT ITS BEST
ONLINE TEACHING AT ITS BEST

Merging Instructional Design with Teaching and Learning Research

Second Edition

Linda B. Nilson
Ludwika A. Goodson
From Linda: To Emma, Abby, and Sophia—all future online students
and
From Ludy: To Leslie J. Briggs, former professor of instructional systems design at Florida State University, who challenged us to answer the burning question, “What do models of teaching have to do with models of instructional design?”
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In addition, Nilson coedited Enhancing Learning with Laptops in the Classroom (Jossey-Bass, 2005) and volumes 25 through 28 of To Improve the Academy: Resources for Faculty, Instructional, and Organizational Development (Anker/Jossey-Bass, 2007–2010), which is the major publication of the Professional and Organizational Development (POD) Network in Higher Education.

Nilson’s career as a full-time faculty development director spanned over twenty-five years, which included teaching graduate seminars on college teaching. She retired from Clemson University in 2016. She has published many articles and book chapters and has given over 550 keynotes, webinars, and live workshops at conferences, colleges, and universities both nationally and internationally on dozens of topics related to college teaching and scholarly productivity. She was both an expert speaker and a consultant in the Effective Teaching Course by the Association of University and College Educators (ACUE).

Before coming to Clemson University in 1998, she directed teaching centers at Vanderbilt University and the University of California, Riverside, and was a sociology professor at UCLA, where she entered the area of educational development. After distinguishing herself as an excellent instructor, her department selected her to establish and supervise its teaching assistant training program. In sociology, her research focused on occupations and work, social stratification, political sociology, and natural disaster behavior.

Nilson has held leadership positions in the POD Network, Toastmasters International, Mensa, and the Southern Regional Faculty and Instructional Development Consortium, as well as membership in the Society for Teaching and Learning in Higher Education (STLHE).

She was a National Science Foundation Fellow at the University of Wisconsin, Madison, where she received her PhD and MS degrees in sociology. She completed her undergraduate work at the University of California, Berkeley.
Ludwika A. Goodson is former associate director for faculty development at the Center for the Enhancement of Learning and Teaching (CELT) at Purdue University Fort Wayne and coauthor of the first edition of *Online Teaching at Its Best: Merging Instructional Design with Teaching and Learning Research* with Linda B. Nilson. Goodson’s article on “A Comparative Analysis of Models of Instructional Design,” with coauthor Dee Andrews, has been republished multiple times, most recently in the third edition of *Instructional Technology: Past, Present, and Future* (2011). Other publications include “Knowledge and Skill Hierarchies” in the *SAGE Encyclopedia of Educational Technology* (2015) and “Consulting and Designing in the Fast Lane” in *Real-Life Distance Learning: Case Studies in Research and Practice* (2014).

Goodson began her career as a teacher at Iowa State University of Science and Technology, and has been an instructional designer and project manager for over thirty years, the last twenty of which focused on online teaching in higher education. Goodson earned her MA degree in Educational Technology at Sir George Williams University in classes taught by BBC and CBC producers and media education specialists. At Florida State University, she completed doctoral courses in classes taught by scholars and leaders in instructional design. After successfully completing preliminary exams, she formed her company, Instructional Systems Design, and for the next ten years, supervised instructional designers and media consultants in education and evaluation projects for a dozen different agencies.

Goodson then returned to Florida State to conduct research and develop curricula in the Educational Services Program (ESP). With the university’s expanded interest in online teaching, she left ESP and became a project manager and senior instructional designer at the Office of Distributed and Distance Learning. Later, at Georgia Southern University, she broadened her focus to include faculty development and teaching and assessment practices for both classroom and online learning. She then returned to Florida, joining Embry Riddle Aeronautical University’s Worldwide Division, where she produced online courses and taught an award-winning online course to prepare faculty for online teaching. At Purdue University Fort Wayne, she continued her consultations with faculty to support classroom and online teaching, the scholarship of teaching and learning, and assessment and evaluation practices.

In addition, Goodson has consulted on faculty development projects, including National Science Foundation and privately grant-supported projects in science, technology, engineering, and mathematics (STEM), as well as special topics and activities to support online teaching for the Association of College and University Educators (ACUE). Goodson continues her work as a reviewer for the *Journal on Excellence in College Teaching*, and maintains her membership in the Association for Educational Communications and Technology (AECT) and the Society for Teaching and Learning in Higher Education (STLHE), as well as ongoing engagement with POD faculty discussions about online teaching.
Wiley conferred on us a great honor asking us to write a second edition of this book. We also regard this as a golden opportunity to catch up our readers on the earth-shaking changes that COVID-19 effected on teaching and learning around the world. The terms remote teaching and hyflex meant little before the spring of 2020, and they are now standard teaching modes. Who says that the academy is slow to change? Of course, online education has been with us for decades and has increased in each of the past fourteen years. In fact, it has been growing faster than ever the past several years, and fully online courses are now multiplying across our country (Seaman, Allen, & Seaman, 2018).

As in the first edition, we focus on best teaching practices, those anchored in research and derived from cognitive science, learning theory, proven course design methods, and motivational techniques. They apply across all modes, platforms, and environments, and they transcend technology, which too many other books on online teaching overemphasize. Still, we do share information on many of the technologies available to accomplish certain pedagogical tasks. We also provide real examples of best practices for clarification but not as a substitute for evidence.

**NEW FEATURES OF THIS SECOND EDITION**

So much has happened in higher education during the past year or so that it should be no surprise that we include a great deal of new material throughout the book on both remote and hyflex teaching:

- How the remote and hyflex teaching modes work
- What we know and don’t know about their effects on student learning
- Which of their features and tools that students find satisfying and enjoyable, and which they don’t
- How to make best use of each of them
- How to incorporate best teaching practices while using them
- The challenges and pitfalls that they present and how faculty can avoid those that can be avoided—to include “Zoom fatigue,” low student engagement, lack of community, the technological limitations of many students, the greater workload, and more
- The legitimate concerns that faculty have about using them
- The kind of training and professional development in these modes that faculty need
- The role that faculty should play in determining their use
Of course, we maintain our focus on designing and implementing fully online courses to optimize their effectiveness, and we update the research on these topics. What hasn’t changed is the need to make evidence-based pedagogy and student learning the primary consideration in making all course decisions. This advice should inform the actions of instructional designers, technologists, and administrators, as well as faculty.

Here are some other new topics covered in this second edition:

- Course menu and course map templates used at a host of institutions
- Various forms of informal, formative assessment, including the many polling, survey, and quiz tools available
- More on setting up and overseeing group projects
- Many dozens of online sources for problem-based learning problems and cases, including those with an international focus
- Collaboration tools for students working on projects
- Strategies for leading class discussions in remote, hyflex, and online modes
- Many types of small group activities and many possible tasks for them
- Quizzes as learning activities
- Best practices in planning and recording micro-lectures
- Tools for embedding quizzes, reflections, and self-assessments in micro-lectures
- Strategies and tools for recording micro-lectures
- New policy statements in the syllabus that some institutions recommend or require
- Free online image collections
- A short guide for rapidly transitioning from face-to-face to partially or fully online teaching
- Hundreds of additional and updated websites for instructional videos, podcasts, text materials, webinars, multimedia, OERs (open educational resources), and online STEM demonstrations, simulations, laboratories, and other learning activities

THE AUDIENCES FOR THIS BOOK

We have developed the second edition of *Online Teaching at Its Best: Merging Instructional Design with Teaching and Learning Research* with six readerships in mind:

First and foremost are faculty across disciplines and institutional types who are suddenly having to teach in what is for them a new mode, whether remote, hyflex, hybrid, or fully online. Most likely, they have already taught in one or more of these modes with little guidance and confidence in their pedagogical decisions. However they teach, they want to do their best by their students but don’t know how. This book can light the way for them.

Second, we hope to help faculty who want to begin designing and teaching an online course or would like to improve their current online courses. The book speaks the faculty’s language—that of the teaching culture—rather than that of the customary information technology and instructional design cultures. We draw on cognitive science to explain how learning works and on both instructional design research and the scholarship of teaching and learning to recommend research-based teaching methods for the online environment. Our emphasis on evidence-based practices makes this book the most scholarly of its kind available today.

Unfortunately, institutions and organizations for online course design gloss over pedagogy in their minimum standards for online courses. Their approaches focus on technology, implying that good teaching practices rank as less important. We maintain that the quality of teaching is central to the success of courses in all modes. Courses should excel in a cognitive walk-through, not only in meeting online course design standards (Earnshaw, Tawfik, & Schmidt, 2018; Youger & Ahern, 2015).

Third, we have in mind the faculty and educational developers and instructional designers charged with training faculty in the various teaching modes. During the pandemic, these professionals have faced exhaustion in helping faculty
through so many transitions, in addition to conducting their standard training and orientation programs. Chances are, they have struggled to keep up with their field.

Fourth, we wrote this book to serve as a text for undergraduate and graduate students in courses in education, curriculum and instruction, instructional design, and instructional systems design. We hope to ensure that when they graduate, they will begin their careers with a solid background in research-based course design, teaching, assessment, community building, motivational methods, and accessibility measures.

Our fifth and sixth audiences constitute two types of college and university administrators: (1) those who realize that their faculty still need plenty of help in shifting successfully from face-to-face instruction to some other mode or modes—a category that few colleges and universities escape; and (2) those at online institutions, such as the University of Phoenix, Western Governors University, Nova Southeastern University, Southern New Hampshire University, and Purdue Global, who are seriously committed to increasing student retention in their programs and supporting their faculty. We advise administrators on what they can do to accomplish their goals.

### HOW THIS BOOK IS ORGANIZED

We hold true to faculty’s primary end, which is student learning, and their primary means, which is evidence-based pedagogy. Therefore, we organize each of the chapters not around a technological tool—such as the discussion board, open educational resources, or video-recording software—but around a best teaching practice as applied to remote, hyflex, and online courses. All such practices transcend the environment and, while implemented using technology, otherwise have little to do with technology. Chapter 1, which focuses on best teaching practices that research has identified thus far, drives this point home. We summarize those practices from different sources and integrate them into one list that applies across teaching modes.

Chapter 2, on setting significant outcomes, is the starting point for course design. What do significant outcomes have to do with technology? The only connection is a back-handed one. Perhaps because technology has rendered facts and figures so readily available, we are compelled more than ever before to focus on “deeper and richer experiences of teaching and learning” (Barbezat, Zajonc, Palmer, & Bush, 2014, p. 3). Content is no longer enough. We have to establish a course on functional relevance (Snelbecker, Miller, & Zheng, 2008), as a purposeful enterprise (Gagné & Merrill, 2000; Smith & Ragan, 2005a, 2005b), and a means to “significant learning” (Fink, 2013). Students want to know, “So what?” They may apply new concepts and master new procedures, but how do these fit into the bigger picture of worthwhile human activity? How does their new knowledge solve real problems?

We propose ways to integrate significant outcomes into courses. We also provide and compare examples of such outcomes in online courses that vary by discipline and learning objectives, such as creativity, problem-solving, situated cognition, knowledge construction, and learning from errors. Then we illustrate how significant outcomes in turn shape course design.

Where this chapter leaves off, the next one begins, and it brings in technology only as a means to an end. Chapter 3, which describes how to design a coherent, well-aligned course, starts with formulating clear, assessable student learning outcomes. These outcomes furnish the foundation for any course in any environment. Coherence requires aligning every other aspect of a course—the content, learning activities, and assessments—with those outcomes. As the evidence tells us, it leads to better learning (Biggs, 2003; Chesbrough, Davachi, Rock, Slaughter, & Grant, 2019; Dick, Carey, & Carey, 2015; Fink, 2013; Smith & Ragan, 2005a, 2005b; Wiggins & McTighe, 2011). To help us along, the instructional systems literature suggests a couple of templates. Because assessments should simply mirror outcomes, the process of developing assessments for cognitive outcomes may seem straightforward. But it involves a range of different testing tools and assignments. In addition, significant learning encompasses affective, ethical, self-regulatory, and social behavioral changes in students, and assessing these in any mode presents genuine challenges. So we have a lengthy section on assessment.
Deciding which learning activities will most effectively and efficiently enable students to achieve the course outcomes presents another set of nonobvious decisions. While classroom faculty already have a few sources to turn to, such as Davis and Arend (2013) and Nilson (2016), those who teach online, remotely, or in a hyflex classroom receive little guidance. While some classroom methods can transfer easily from the live, not all do, so we focus on ways to implement them in other modes.

Finally, we address practical issues in developing an online course, some of which involve technology, such as constructing a syllabus, following online copyright guidelines, managing files, and upholding academic integrity, to name a few.

In chapter 4, we turn to the cognitive scientific principles behind many of the teaching methods that we list in chapter 1. These principles tell us how the mind works and learns, so they should guide how we teach in any mode. We focus on ways to implement these principles in remote, hyflex, and online courses. Online faculty in particular have considerably fewer “actionable instructional tactics” (Williams, 2013) than classroom instructors and little guidance on how to use technology for learning (Dailey-Hebert, 2018; Ehrman, 2013). We know the power of these principles because when even a novice instructor implements just some of them, students attend classes at a higher rate, are more engaged, and learn twice as much as students in a lecture-based course taught by an experienced instructor (Deslauriers, Schelew, & Wieman, 2011).

However, we can design a tightly aligned course and incorporate evidence-based learning experiences and still see very little learning if the students fail to invest sufficient time and effort. This is where motivation comes in, the focus of chapter 5. Because research has failed to reveal any magic motivational bullets, faculty have to weave into their courses multiple motivating elements because different students respond differently to each one. Perhaps this explains why there are so many theories of motivation. Student persistence has been an issue in all learning environments but especially online. We also review the research on how factors other than motivation influence student persistence (the course pace, students’ control over the sequence of learning, and the relevance of the content, to name a few), but motivation may mediate their effects.

Both the literature on classroom teaching and that on online teaching identify feedback and grading policies and the types of communication, activities, assignments, and assessments that boost student motivation, but the overlap between the two lines of research is minimal. This just shows how bifurcated the teaching literature remains. We bring the two lists together to create a powerful collection of motivating factors and suggest ways to build these into courses across modes. We also link these factors to one or more of the many theories of motivation.

Chapter 6 turns to the social side of teaching and learning: developing interactivity, social connections, and community. This side represents one set of high-impact practices over which faculty have complete control: student–instructor, student–content, and student–student interaction. This chapter opens with a review of the literature on the effects of these interactions—specifically, how the quantity and the quality of each type influence student persistence, performance, course completion, and satisfaction.

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. Many channels are available, and we explain how to narrow the options to best serve the course goals and content. Meaningful student–student interactions can involve sharing, collaboration, peer review, or peer instruction on any of several whole-class or small-group communication platforms. Student–content interaction encompasses various media representations, discussion formats, interactive technologies, carefully chosen social media, study aids, and connections with subject librarians. The procedures in chapter 7 help ensure that all students can participate equally in any course that requires instructor–developed material. We address the three challenges faculty face in making a course accessible:

1. **Attitude.** Some faculty look on universal design as just another set of technical chores they have to do to stay out of trouble with instructional designers and the administration. We foster a positive attitude toward universal design, helping faculty appreciate the fact that it supports all students and ensures inclusion.
2. **Knowledge about tools and formats.** Faculty need to recognize which tools and formats (document and media) support accessibility and which do not.

3. **Knowledge about implementation.** Faculty need to learn exactly how to make their course materials accessible.

Most of the chapter focuses on the last challenge, acquainting instructors with the many easy-to-use tools now available and providing instructions on how to use them. Here we name just a few:

- Using YouTube’s closed captioning feature
- Adding “alt text” or “alt tags” to images
- Allowing the readability of tags and structure by correctly saving documents to PDF
- Working around tables and charts
- Using widely available style sets to ensure the readability of text materials

Chapter 8 opens with a focus on the impact of quality courses on student learning, satisfaction, and retention, all of which indirectly affect the reputation of the institution. Of course, we know much more about these effects in the online context, but we expect that they exist in the remote and hyflex realms as well. We then move to detail the difficulties and stresses that faculty experience in teaching remotely, in the hyflex mode, and online, especially for the first few times. For instance, instructors are accustomed to communicating with students face-to-face and expect a certain type of student participation and social dynamic between them and a class. In the other modes, technology mediates all communication, participation, and social relationships.

The rest of the chapter addresses the support that these faculty need from their institutions if the administration is willing to give it. Some of this support pertains to technology, but most of it relates to the professional development that faculty receive. Even in the remote and hyflex modes, instructors need training to teach well, which not all administrators realize. Fully online faculty require even more training and support, as well as release time and workload management advice. For this reason, we give a great deal of attention to designing effective professional development programs, especially for online faculty. After all, faculty do make the difference in what students learn (Condon, Iverson, Manduca, Ruiz, & Willett, 2015; Umbach & Wawrzynski, 2005), and only well-prepared, confident instructors can design and teach top-quality courses that retain and gratify students.

Administrators have a favorable view of the efficacy of online education (Quality Matters & Eduventures Survey, 2020; Straumsheim, 2016). Yet, they may fail to appreciate disparate perceptions that many faculty have of these different teaching modes—perceptions that often grow out of difficult and disappointing experiences in rapidly moving to remote, blended, or fully online teaching. Indeed, because faculty do the actual frontline teaching, their perceptions cannot and should not be ignored.

## ACKNOWLEDGMENTS

First, we thank all the people we worked with at Wiley: Riley Harding, associate acquisitions editor; Christine O’Connor, our managing editor; and Mackenzie Thompson, our team’s editorial assistant. Had Riley not recommended a second edition of *Online Teaching at Its Best*, this book would not exist. We thoroughly enjoyed our frequent contacts with all of these fine professionals and are grateful for the faith they put in us.

Ludwika: Though now retired from Purdue University Fort Wayne, I remain grateful for the support from my writing group during my time as an instructional designer and associate director of the Center for the Enhancement of Learning and Teaching (CELT); for the collegial support of the CELT director, Adam Dircksen, who reviewed our first edition and shared his experiences as a communication instructor of face-to-face and online classes; and for the expertise of Kathleen Surface on information technology and the operation of learning management systems.
Thanks to Laura Frost, associate dean, College of Arts and Sciences and professor of chemistry, and to Katie Johnson, associate professor, Department of Mathematics at Florida Gulf Coast University for their review of STEM resources in this second edition. Thanks also to the following instructors of face-to-face and online classes who contribute to real-world examples throughout this book: Jeong-Il Cho, Paul Edwards, Anna Gibson, Regina Gordon, Xiaokai “Katie” Jia, Denise Jordan, John LaMaster, Linda Lolkus, Veronika Ospina-Kammerer, and Yvonne Zubovic. My gratitude extends to Stephen Estabrooks, a research biologist and teacher, for his never-failing support and deep appreciation. He often said of the contents of this book, “These strategies would make anyone a better teacher.” Finally, I am grateful for this blue-ribbon adventure of remote collaboration in writing this second edition with Linda!

Linda: I am also grateful for the wonderful collaboration that Ludy and I have enjoyed on this second edition! Because I am retired from Clemson University, I haven’t been able to derive the motivational benefits of a writing group, as I did while writing the first edition. But I thank Riley for giving us a tight deadline for completing the second edition. If Ludy and I say we will get you a manuscript by whatever date, we will move heaven and earth to stay true to our word, which is sacred to both of us. Besides, what else is one to do while stuck at home during a pandemic?

Fortunately, I was stuck at home with my husband, Greg Bauernfeind, who enthusiastically celebrated my writing progress with me. In fact, he cleared much of the way for my progress, picking up tasks at home along the way so I didn’t have to break my writing concentration. Greg has been such a support to me since we met 22 years ago. I have no idea where my career would have gone if he hadn’t been in my life.

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■ REFERENCES


CHAPTER 1

Teaching at Its Best, No Matter What the Environment

Abundant research shows that excellent teaching rests on the same principles across all platforms. Drawing on these principles, we identify best practices gleaned from the face-to-face teaching literature and argue for their applicability in all other modes. However, distance education in its hyflex, remote, hybrid (blended), and fully online forms holds special challenges that stem from both students and instructors—challenges that classroom teaching does not present. Sometimes the emphasis on technology and the pressure of time distract faculty and instructional designers from integrating the best teaching practices in their courses. Different readerships for the body of teaching and learning research and that of instructional design exacerbate the challenge of keeping best teaching practices at the forefront. This book aims to integrate these two literatures.

*Any given instructional strategy can be supported by a number of contrasting technologies (old and new), just as any given technology might support different instructional strategies. But for any given instructional strategy, some technologies are better than others: Better to turn a screw with a screwdriver than a hammer—a dime may also do the trick, but a screwdriver is usually better.*


### TEACHING QUALITY AS KEY TO LEARNING

Like Chickering and Ehrmann (1996), we start from the premise that excellent teaching is excellent teaching—and, conversely, ineffective teaching is ineffective teaching—whether the environment is classroom-based, online, hybrid, remote, or hyflex. Why? Because in terms of the mind, learning is learning, and what matters most in learning is good teaching, not the technology (Jackson & Anagnostopoulou, 2018; Lederman, 2020c; Simonson & Schlosser, 2009).
Best Practices from the Classroom Teaching Literature

To identify proven principles of teaching and learning, we have to turn first to the face-to-face teaching literature. Being the oldest type, this teaching mode has led the way in defining best practices, so we first examine these practices. We also feature a few of the parallels with instructional design. We began with the classic seven principles of good practice identified by Chickering and Gamson (1987) and based on a review of almost forty scholarly publications:

1. Encourage contact between students and faculty
2. Develop reciprocity and cooperation among students
3. Encourage active learning
4. Give prompt feedback
5. Emphasize time on task
6. Communicate high expectations
7. Respect diverse talents and ways of learning

Nine years later, Chickering and Ehrmann (1996) explained how these seven principles can easily translate from the classroom to the online environment using various instructional technologies. Instructors have gradually integrated these principles into classroom practices and teaching with technology, including some online courses (Chickering & Gamson, 1999; Hathaway, 2014; Johnson, 2014; Lai & Savage, 2013; Mehall, 2020; Tanis, 2020).

Based on research in education and educational psychology, Bransford, Brown, and Cocking (1999) wrote a seminal work about how people learn, but they focused on memory issues in school children and did not propose learning principles. However, later books about college-level teaching and learning adopted some of their major points as general principles applicable to everyone—for example, on the importance of learners practicing metacognition, structuring knowledge, and having valid prior knowledge on which to connect new knowledge.

The first of these later books, by Ambrose, Bridges, DiPietro, Lovett, and Norman (2010), lays out seven principles of learning with implications for effective teaching:

1. The amount of students’ prior knowledge on a subject affects their learning and performance—the more prior knowledge, the easier and better the learning and the stronger the performance. However, inaccurate, inert, or insufficient prior knowledge can hinder learning and performance.
   
   *Teaching implications:* Instructors should find out what that prior knowledge is, remediate or activate it in students, have students self-assess their familiarity with it, and try to identify errors and misconceptions in that knowledge. Instructors should then address these misconceptions explicitly and find ways to discredit them.

2. The way students organize their prior knowledge also affects their learning and performance.
   
   *Teaching implications:* Instructors should help ensure that the organization of their students’ knowledge is valid and rich with connections between important and meaningful features—major concepts, principles, and categories, for example.

3. Students’ motivation determines how much effort and persistence they will put toward their learning.
   
   *Teaching implications:* Instructors should enhance the value of the material for students and create a supportive environment for learning. To enhance the value, they should show enthusiasm, reward students for achieving outcomes, and demonstrate the relevance of the material to real-world applications and students’ current and future lives. To increase support for learning, they should do things like develop a course that aligns outcomes, learning activities, and assessments; incorporate early assessments that build student confidence; help students learn how to learn the material; clearly explain expectations for performance; and provide prompt feedback accordingly. Building in choice and reflection on the learning also increases both the value of the learning and the support for it.
4. Students develop mastery only when they can competently perform and integrate the component skills and apply them in the appropriate circumstances.

**Teaching implications:** Instructors should decompose complex tasks into component skills, diagnose and provide practice for students in their weaker skills in different contexts, include the integration of skills in assessments, have students link contextual learning experiences to general principles, and give them practice in deciding where different skills and knowledge apply in various contexts.

5. Students need sufficient practice in meeting specific performance criteria at the desired level of competency, coupled with timely feedback targeted to improving performance on the specific criteria.

**Teaching implications:** Instructors should start a course by assessing their students' performance level and adjusting the level of their practice to a reasonable level. Then instructors should make their performance goals, criteria, and standards explicit; scaffold complex tasks in decreasing detail over time; provide plenty of practice opportunities; supply models of strong and weak performances; incorporate instructor and peer feedback to groups as well as individuals; and have students explain how they use feedback in later work.

6. Students' learning is affected by the interactions of their level of social, emotional, and intellectual development with the climate of the course on the same dimensions. Faculty cannot influence the level of development that students bring into a course, but they do have control over the course climate. The more positive the climate, the more students are likely to learn.

**Teaching implications:** Instructors should foster the safe expression of different points of views, answers to questions, and approaches to a problem, in part by posing questions and problems that are open to multiple respectable responses. In addition, instructors should choose inclusive content and examples, model inclusive behavior and language, personalize the class as much as possible, have students generate ground rules for interaction, require them to provide evidence to back up their claims, encourage and model active listening, turn tensions and disagreements into learning opportunities, and obtain and respond to student feedback on class climate.

7. Students need to practice self-regulated learning before they can become self-directed learners. That is, they must plan, monitor, and evaluate their learning and modify their strategies accordingly to optimize their learning.

**Teaching implications:** Instructors should provide opportunities for students to analyze assignments, assessment rubrics, and examples of both excellent and poor products. Instructors should also model metacognition and have students reflect on and answer questions that direct them to self-assess and self-correct their work, assess their peers' work, assess their learning, and assess the effectiveness of their study strategies. Of course, these activities take on higher value when instructors explain at least a little about the ability of the brain to change with learning (brain plasticity) and the effort, self-awareness, and persistence that learning requires.

We can identify considerable overlap among these principles, especially principles 1, 2, 4, and 7, and Bransford et al.'s (1999) main points about learning. We can also see parallels with instructional design perspectives, which emphasize identifying student entry-level and prerequisite skills, relating outcomes to the structure and substance of students' mental models, ensuring student support and motivation, providing relevant practice and informative feedback, and varying the learning context to support retention and transfer (Dick, Carey, & Carey, 2015; Gagné, Wager, Golas, & Keller, 2005; Smith & Ragan, 2005a, 2005b).

While Chickering and Gamson's (1987) principles of good practice do not appear among Ambrose et al.'s (2010), some of the latter's principles do imply active learning, student–faculty contact, and student–student reciprocity and cooperation, and principle 5 mentions "prompt feedback," but only as one aspect of the best kind of feedback to give students. This scant overlap testifies to the progress we have made in understanding teaching and learning since the late 1980s.

Davis and Arend (2013) slice the pie somewhat differently, positing primary "ways of learning" for each of seven categories of learning outcomes and tying each category to particularly effective teaching methods, as shown in Table 1.1.
According to Ambrose et al. (2010), students need practice in skills to acquire and refine them, whatever those skills may be. But Davis and Arend (2013) maintain that the context for the most effective practice will vary by the type of skill. If, for example, the skills involve precise procedures or psychomotor operations, the principles of behaviorism applied to practice exercises will most efficiently yield the best results. For another example, instructors can most effectively provide practice in exercising sound professional judgment and action in real-world-like situations, the kind that simulations, games, dramatic scenarios, and role plays afford.

Davis and Arend (2013) recommend flexibility in using their framework, however. They readily point out that feedback in any context borrows from behavioristic principles and would regard case studies, laboratories, and internships as suitable methods for teaching professional judgment. But they wisely alert us to the fact that case studies, simulations, service-learning, discussions, and group activities are ill suited to students who are acquiring procedural skills and basic disciplinary knowledge. By the same token, presentations, practice exercises, role plays, and labs will do much less to help students develop critical thinking skills or an open-minded awareness of multiple perspectives than will discussions, question-driven inquiries, and group work.

Although Ambrose et al. include teaching strategies and student activities to help instructors implement all seven of their best-practice principles, additional refinement proves its worth when it comes time to apply a given principle to a real course. Davis and Arend’s model helps you determine what teaching strategies best align with your
specific outcomes. Similarly, Nilson (2013) refines Ambrose et al.’s principle of self-regulated learning by linking a wide range of planning, monitoring, and self-assessment activities and assignments to various course components and times during the term.

Davis and Arend’s perspective and the instructional design literature overlap in several ways. Instructional designers also emphasize the wisdom of providing students with practice and using different strategies to teach different kinds of knowledge and skills (Dick et al., 2015; Gagné et al., 2010; Jonassen, 2004, 2014; Smith & Ragan, 2005a, 2005b). For example, they identify best strategies for implementing project-, problem-, case-, and inquiry-based learning and for teaching these cognitive and social skills: memorization and recall; understanding; application of concepts; learning in a social context; collaborative creativity; and strategic thinking (Dabbagh, 2019; Merrill, 2018; Reigeluth, 2018; Savery, 2018, 2019; Savin-Baden & Bhakta, 2019; Spielman et al., 2018; Watson & Reigeluth, 2018; West, 2018). For teaching adult learners, expert instructional designers recommend demonstrating empathy (Vann, 2017). For helping students acquire motor skills, they explicitly focus on lowering cognitive load with visualization, verbalization, demonstration, repetitive practice, and error correction strategies (Nicholls, Sweet, Muller, & Hyett, 2016).

Table 1.2 matches various intended learning outcomes with different conditions of learning (recommended teaching strategies) drawn from multiple instructional design resources, primarily Dick et al. (2015), Gagné et al. (2010), Martin and Briggs (1986), and Smith and Ragan (2005a, 2005b), with a few elaborations from Jonassen (2000) and Merrill (2002, 2018).

Table 1.2 Intended Learning Outcomes and Recommended Teaching Strategies

<table>
<thead>
<tr>
<th>Intended Learning Outcomes</th>
<th>Recommended Teaching Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor skills</strong></td>
<td></td>
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<tr>
<td>The student executes muscular movements with standards of speed, accuracy, force, and smoothness.</td>
<td>Introduce whole- and part-task routines. Explain and demonstrate, supplementing with visualization of performance and memory aids such as mnemonics. Guide retrieval and use of mental map for performance. Provide continued practice with informative feedback and opportunities to adjust performance of part skills, connecting skills, and whole skills to desired proficiency level.</td>
</tr>
<tr>
<td><strong>Verbal information</strong></td>
<td></td>
</tr>
<tr>
<td>The student articulates acquired knowledge such as labels or names, facts, and organized knowledge.</td>
<td>Introduce with emotional or novel information or event. Cue retrieval of related larger network. Elaborate relationship of new knowledge to larger network. Provide meaningful context. Segment content into learnable chunks. Represent new knowledge in structure, cases, logical relationships, and memory aids. Arrange active, spaced practice and informative feedback in using new knowledge.</td>
</tr>
<tr>
<td><strong>Conceptual understanding</strong></td>
<td></td>
</tr>
<tr>
<td>The student classifies a concept according to physical, sensory, or defined attributes.</td>
<td>Present a concept with an inquiry approach or something interesting about the concept; add definition. Cue retrieval of component concepts or information. Progress from familiar to unfamiliar, simple to complex, and best examples to fuzzy examples and nonexamples. Draw attention to distinguishing attributes and reasons for fit or nonfit (use questions and explanations). Point out common classification errors. Include concept maps, analogies, images (as appropriate). Arrange spaced practice and informative feedback in classifying examples and nonexamples.</td>
</tr>
</tbody>
</table>

(Continued)
In representing learning outcomes and conditions, you can see that this table shows more similarities than differences with Davis and Arend's framework. Davis and Arend offer more specific examples of methods, whereas the instructional design literature gives a broad strategy that encompasses such examples. For instance, simulations and dramatic scenarios can help develop problem-solving. Davis and Arend also include practicing professional judgment and reflecting on experience as additional outcomes.

One more set of teaching and learning principles, one that overlaps very little with those mentioned thus far, deserves recognition. In their concise, literature-packed volume, Persellin and Daniels (2014) derive six principles, the first three of which come from cognitive psychology and the fourth of which hails from multimedia research. After each principle, they list instructional applications:

1. Desirable difficulties enhance long-term retention.
   
   *Instructional applications:* Quizzes; opportunities for students to generate and apply material; spaced and interleaved practice sessions; occasions for students to work through confusion and frustration; challenging (but comprehensible) readings; extended wait time after posing questions; concept mapping.

### Table 1.2 (Continued)

<table>
<thead>
<tr>
<th>Intended Learning Outcomes</th>
<th>Recommended Teaching Strategies</th>
</tr>
</thead>
</table>
| **Use of lower-order rules**<br>The student uses two or more concepts connected as a rule to solve simple routine problems. | Introduce a rule with inquiry, a novel problem, or interesting use of rule.  
Preview what student will be able to do with the rule, as in future problem-solving.  
Draw attention to related concepts in the rule.  
Guide learning with demonstration and application.  
Point out common errors to avoid, including misconceptions, overgeneralization, or undergeneralization.  
Arrange spaced practice and informative feedback in applying the rule.  
Provide varied situations for application to enhance transfer. |
| **Use of higher-order rules**<br>The student uses two or more rules connected as a problem-solving strategy to solve more complex problems. | Provide authentic meaningful relevant tasks, goal-directed activity (multiple representations of problem and structure).  
Compare and relate to larger task or problem and role of strategic thinking in problem-solving.  
Prompt recall of related previous experiences.  
Differentiate strategies for types of problems (logical, algorithmic, story, rule using, decision making, troubleshooting, diagnostic, case analysis, design, strategic performance, and dilemma).  
Bridge from worked example(s) to problem task.  
Align practice with type of problem and strategy.  
Progress from simple to complex with varied new and relevant problems.  
Encourage reflection on solutions, provide feedback, and fade out coaching (scaffolding). |
| **Cognitive strategies**<br>(self-regulated learning)<br>The student will plan, monitor, and control personal ways of thinking and learning. | Introduce benefits of cognitive strategies.  
Prompt recall of ways of thinking and results.  
Explain strategy(ies) and purpose(s).  
Provide opportunities for inventing and practicing strategies, and experience results. |
| **Attitude (dispositions)**<br>The student will voluntarily express a disposition to make a desired choice among alternatives. | Provide relevant choices, pros and cons, and their consequences.  
Relate choices to larger set of values.  
Stimulate empathy related to choices.  
Provide a respected model who advocates or shows the desired choice and positive results.  
Provide role-playing opportunities.  
Provide situations for making the choice and reinforcement for the desired choice. |