A Model for Understanding University Teaching and Learning

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> *"There is nothing more practical than a good theory."*
>
> Kurt Lewin (1952, p. 169)

The use of theories, metaphors, simulations, and models has been commonplace in higher education, especially in science-based disciplines, to comprehend the incomprehensible, to explain the unexplainable, or to view a picture of the unviewable. Complex issues can be made less complex and simple issues can be made complex through the use of an analog representation (model) that enables researchers or practitioners to develop intervention strategies or solve problems. It appears to me that one way to develop approaches to improve the teaching and learning in higher education is to develop and use a model that illustrates the multiple variables that fall under the term *college teaching*.

What Are Models?

In a general sense, a model is a simplified representation of a system that concentrates attention on specific aspects of the system (Ingham & Gilbert, 1991). A model allows aspects of the system (i.e., processes, structure, objects, events, ideas) that are complex or abstract to be rendered either visible or more easily understood (Gilbert, 1995; Gobert & Buckley, 2000). A model is an icon that

embodies features from the original in a way that says, "*This* is how the original is" (Black, 1962, p. 221).

The *Oxford Advanced Learner's Dictionary* (Oxford University Press, 2011) provides two definitions of a *model* that are relevant to this discussion: a copy of something, usually smaller than the original object, and a simple description of a system used for explaining how something works or calculating what might happen. Paul Samuelson and William Nordhaus (1998) define a model as a formal framework for representing the basic features of a complex system by a few central relationships. Models can take the form of graphs, mathematical equations, and computer programs. David Begg, Stanley Fischer, and Rudiger Dornbusch (2000) indicate that a *model* or theory makes a series of simplifications from which it deduces how people will behave. It is a deliberate simplification of reality. Scientists and mathematicians use their models in problem-solving and problem-analyzing processes, and economists use models in economics to analyze and visualize economic problems (Kaewsuwan, 2002).

Characteristics of Good Models

Others have attempted to identify the characteristics of a "good" theory (Huberman & Miles, 1994; Popper, 1963; Swan, 1994; Ur, 2001), but I have been unable to find a list of the characteristics of a "good" model. Therefore, I will extrapolate from the characteristics of the former presented by Penny Ur (2001) to describe those of the latter:

- Plausibility: The model appears to be in accordance with experience and data. The model is truthful to what we know, as limited as that knowledge may be; it is true as far as we can assess from rational observation and experience.
- Simplicity: The model presents a representation or explanation that avoids complications and is as simple as possible. A good model is elegant in that it expresses its meaning with the least amount of words, figures, or ideas possible.
- Explicitness: The model is presented and stated in clear and understandable terms. It is easily communicated to others so that it can be used by others to extend knowledge and application.
- Comprehensiveness: A good model encompasses all of the data and variables necessary for understanding an application.
- Limited: The model includes what is necessary and clearly indicates where or to what it does and does not apply. The boundaries and demarcations of the model are clear.
- Usefulness: The model clearly explains what is going on so that it can generate, explain, or predict present and future action. A good model is useful and practical.

- Testable: The model presents ideas that can be tested, verified, or rejected.
- Aesthetic appeal: The model is visually, verbally, and graphically clear and elegant. A good model is not cluttered with unnecessary images or words and is visually attractive or stated in a compelling metaphor (Ellis, 1997).

Why Use a Model to Understand Teaching and Learning?

Models are communication tools to summarize, generalize, or transmit understanding to help make a complex process or concept more easily comprehended. Models inform practice. Models can lead to the building of theories, which in turn can lead to creation of hypotheses that lead to testing, intervention, and change. In the case of teaching and learning, a model can create a holistic conceptualization of teaching and learning to provide a framework for research and understanding to assist improvement efforts. A model illustrates the connections and interconnections between variables of interest. A model of teaching and learning helps the teacher and educational researcher understand the interplay between variables and their interdependence. Such awareness can provide multiple points of intervention as change in one element or variable in the model can stimulate change in others. This systemic approach can maximize efforts to improve teaching and learning and empower teachers in teaching improvement efforts.

A model also visually highlights the complexity of what is being modeled. A model of college teaching and learning says to teachers that there is more to teaching than what one does in front of students. Understanding the dynamic nature of the instructional process, and ways to improve it, requires knowledge about issues that take place before, during, and after the information-sharing process.

Understanding the complexity of teaching and learning can help avoid a "techquie" approach to teaching improvement. By this I mean the all too often attempt to improve teaching by the imitation or adoption of a teaching technique (e.g., "clickers," problem-based learning, cooperative learning, jigsaw teaching) without a full understanding of the pedagogical reasons for the use of such a technique, or of its impact on other variables in the teaching and learning process.

Precursor Models of Teaching and Learning

The Transmission Model of Teaching and Learning

Based on the prevalent form of instruction in the majority of higher education classrooms around the world, the lecture, one would assume

that teaching and learning is a simple process. The teacher's (the expert) job is to transfer knowledge through talking to students (the novice) whose role is to receive knowledge through listening, watching, and maybe taking notes. The professor's job is to profess and the students' job is to receive, interpret, and internalize the "professtations"—the professor's words and actions. This top-down transition model of teaching "has prevailed throughout fundamental innovations including writing, books, computers, and the Internet." (Laurillard, n.d., p. 1). The transmission model can be called the default conceptualization of teaching and is illustrated in Figure 1.1.

This default model is fraught with difficulties, the most significant of which is its very simplicity. Such a conceptualization ignores the complexity of the teaching-learning process and the importance and interplay of many influential variables. Having a comprehensive model from which to view teaching and learning can guide individual faculty members in the design of teaching and learning actions and environments and guide educational developers in selecting and presenting the content for instructor training programs.

Figure 1.1   The Transmission Model of Teaching
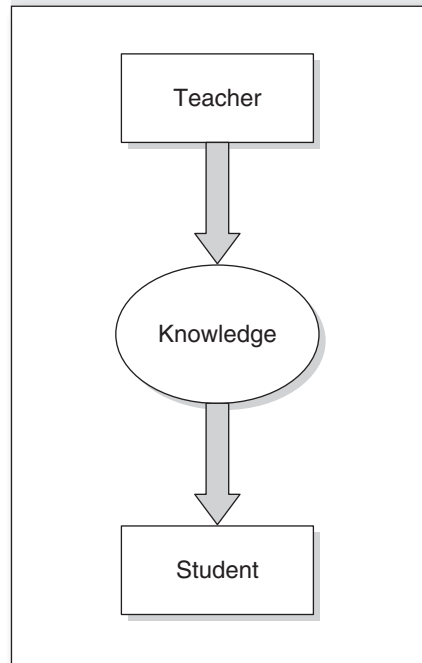
## Lowman's Two-Dimensional Conceptualization of Effective College Teaching

Joseph Lowman's (1995) model was developed as a result of his research analyzing the adjectives used to describe excellent teachers in letters submitted for the chancellor's teaching awards at the University of North Carolina. Lowman's factor analysis of student evaluations of teaching performance yielded two factors, teaching technique and rapport, as the most critical variables in effective teaching (see Table 1.1). Lowman identified a two-dimensional model of exemplary teaching that focused on intellectual excitement created by instructor clarity in the classroom, and interpersonal rapport and relationship building with students. This model can be characterized as teacher-centered and performance-based, and it does not focus on pre-instruction behaviors or the influence of the instructional setting. Classroom dynamics, such as student and teacher attitudes and class moral and some psychological issues of teachers and students are mentioned (i.e., sources of satisfaction and dissatisfaction, communication styles, interpersonal interaction between teachers and students, affective and classroom control measures) but Lowman's focus is primarily on the teaching skills of instructors.

Table 1.1   Lowman's Two-Dimensional Model of Effective College Teaching

Dimension 1: Intellectual Excitement
- Clarity of presentations (what is presented)
- Emotional impact on students (way material is presented)

Dimension 2: Interpersonal Rapport
- Awareness of interpersonal nature of the classroom
- Communication skills that enhance motivation and enjoyment of learning and that foster independent learning

## Teaching-Learning Transactional Model of College Teaching

David Dees and colleagues (2007) developed their transactional model to provide a framework to guide college teacher reflection "before, in-the-moment, and after the event, that recognizes the complexity of the act of teaching, is sensitive to the aesthetic dimensions of both teaching and reflection, and provides a context to examine tacit decisions made during the act of teaching." (p. 130). The model is a qualitative description of the key elements of teaching to bring them out in the open to encourage reflection, discussion, and holistic inquiry. The transactional aspect of Dees et al.'s model (see Figure 1.2) illustrates the connected back and forth aspect of the various instructional elements.

Figure 1.2   Teaching-Learning Transactional Model of College Teaching (modified from Dees et al., 2007, p. 132)
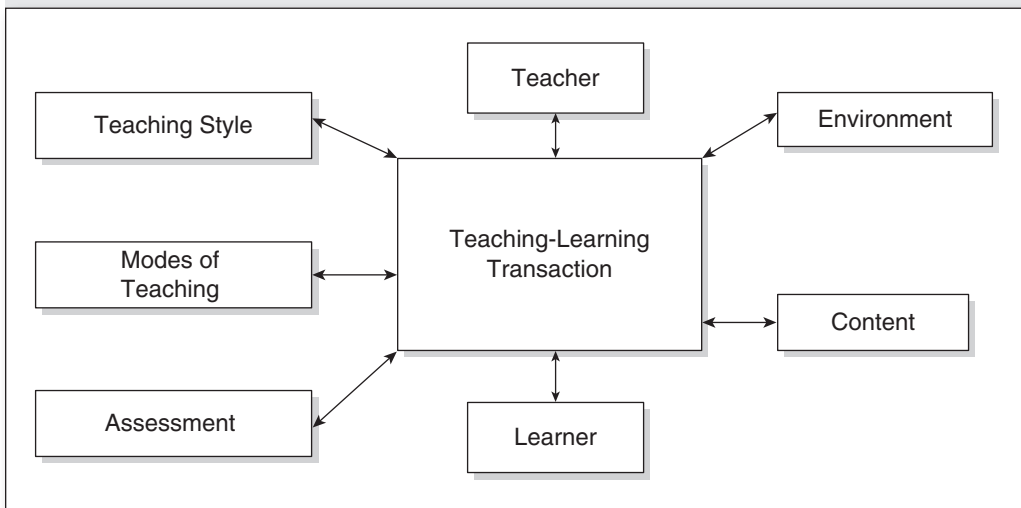
A Model for the Study of Classroom Teaching

Michael Dunkin and Bruce Biddle (1974), based on an earlier formulation by Harold Mitzel (1960), proposed a four-variable model to help educational researchers better understand the complex aspects of classroom instruction (see Figure 1.3). Developed primarily to assist researchers to organize findings of research on teaching, this model illustrated the complexity and interconnectedness of college teaching. Dunkin and Biddle's model contains four classes of variables for study: presage (teacher characteristics, experiences, training), context (properties of pupils, schools, community, classroom), process (teacher and student actions), and product (immediate and long-term effects). Each rectangle in the model represents a region of variables deserving of research, and the arrows presume a causative relationship between regions and are sources of hypotheses for future research. This model had "an enormous impact" (Shulman, 1986, p. 6) on the field of educational research by providing a theoretical framework and vocabulary for those studying teaching and learning.

Figure 1.3   A Model for the Study of Classroom Teaching (from Dunkin, *The Study of Teaching*, 1E. © 1974 Wadsworth, a part of Cengage Learning, Inc. Reproduced by permission. www.cengage.com/permissions)
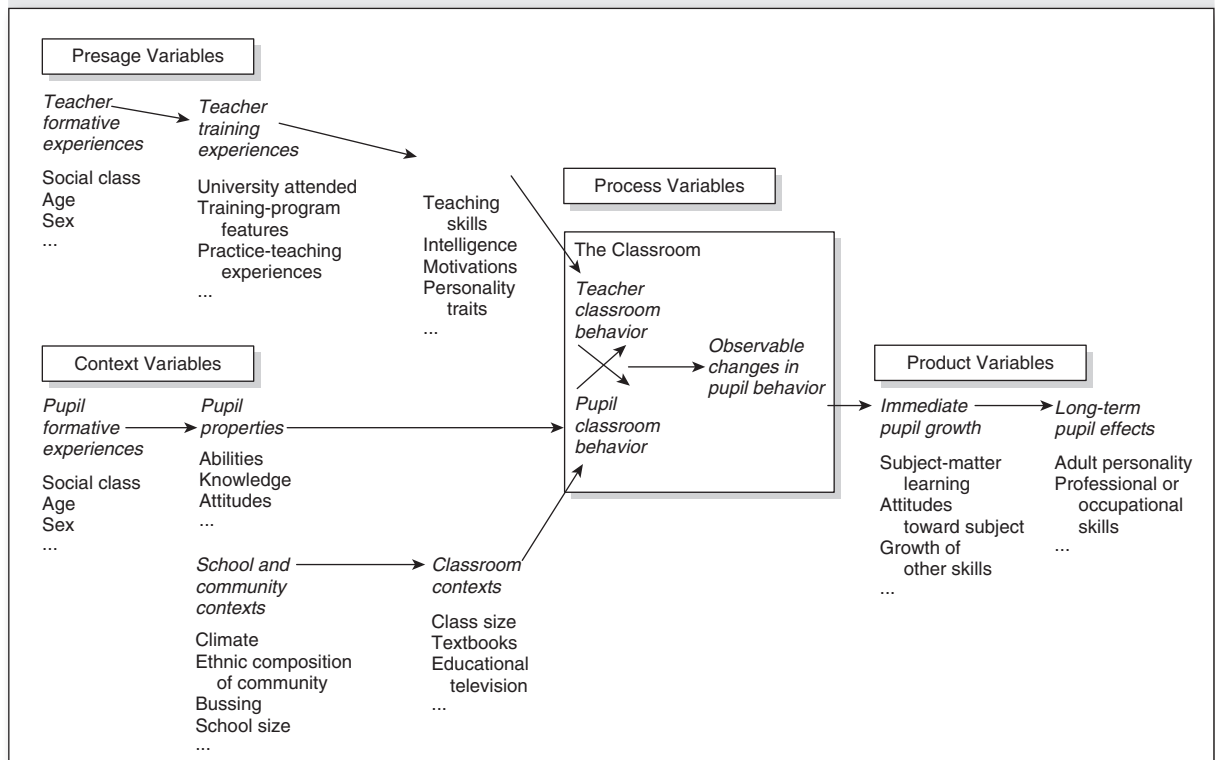
Groccia's Model for Understanding Teaching and Learning

I have developed a model for understanding university teaching and learning that share many of the components presented in the previous models. The model was initially described in a newsletter published at the University of Missouri (Groccia, 1997) as a way to organize and describe the activities of the campus teaching and learning center. The model also appeared in the *POD Network News* (Groccia, 2007) and in a book chapter on facilitating social justice education (St. Clair & Groccia, 2009) to provide a framework for faculty developers to conceptualize their activities.

This model consists of seven interrelated variables that influence teaching and learning: learning outcomes, instructional processes, course content, teacher and student characteristics, learning process, and learning context (Figure 1.4). These variables are not new to faculty in higher education. But, for many reasons, faculty members tend to focus on one or two of them and overlook the others. Each variable is represented by an oval, and the lines connecting the ovals represent their interconnectivity. Learning outcomes (product variables) are placed at the bottom of the model to illustrate that they are the foundation upon which all the other variables rest. In concert with the principles of backward course design, an understanding of university teaching and learning begins at the end—knowledge of teaching and learning goals and outcomes (i.e., determining what students are supposed to learn comes before the design of instructional or assessment methods). The large oval in the center of the model represents what the teacher and students do, the teaching and learning behaviors, techniques, and methods (process variables). The ovals at the top of the model can be considered indicator or preliminary variables, and represent factors that should be assessed and understood before teaching and determining appropriate learning outcomes. These are similar to L. Dee Fink's (2003) situational factors and Michael Dunkin and Bruce Biddle's (1974) presage and context variables. I believe that this model satisfies the conditions of a good model in that it is plausible, simple, explicit, comprehensive, limited, useful, and testable and has aesthetic appeal.

The first variable for instructors to consider in understanding teaching and learning is what they want students to get from the instructional experience, the *learning outcomes*. These are the short- and long-term learning goals and outcomes of the instructional experience. Assessment is a key function to determine whether identified learning outcomes have been met through the instructional processes that reflect the instructor, learner, learning process, learning context, and content variables of the model. Objective and subjective assessment techniques as well as summative and formative assessment methods to measure learning outcome attainment should be determined before instruction as well as throughout the teaching and learning experience. Included in this variable are also measures to assess teaching effectiveness.

Figure 1.4   Groccia's Model for Understanding Teaching and Learning (Groccia, 1997, used with permission of author)
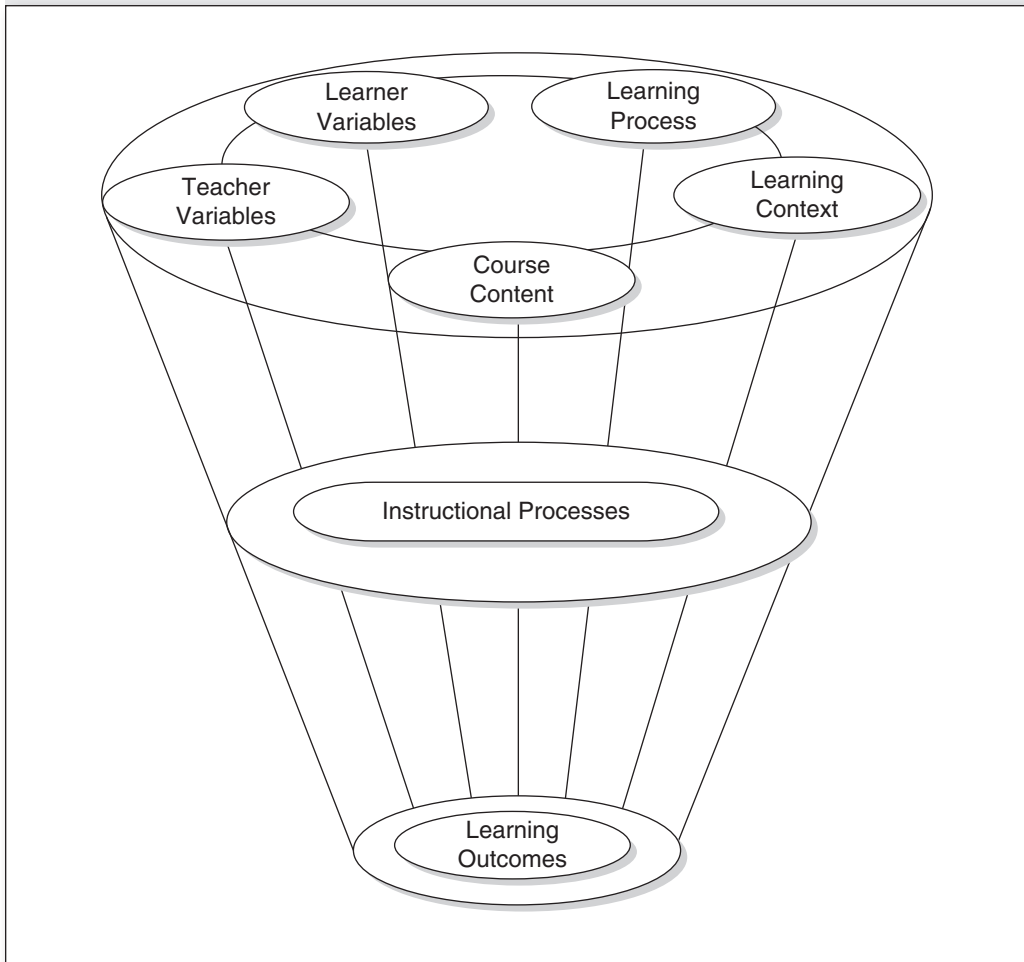
Moving to the top ring of ovals in this model, another variable to consider, *instructor variables*, emphasizes that instructors need to understand who they are and what they bring to the learning situation. Socioeconomic status, race, gender, age, and cultural background; academic preparation; and personal characteristics, such as thinking and learning styles, enthusiasm, rapport, and attitudes and values, all affect teaching and learning. The more instructors understand themselves, the better able they will be to capitalize on their strengths, minimize their weaknesses, and ultimately improve their teaching and students' learning.

A third set of variables relates to *the learner*. Like their instructors, learners' backgrounds, academic preparation, and individual characteristics

influence learning. Armed with an understanding of the learners, through frequent and regular assessments, faculty members are better able to develop learning activities that are accessible to students in ways that are appropriate to their skills, interests, and needs.

Teaching and learning can be enhanced by knowledge of the *learning process*. Human learning has been thoroughly researched during the past 100 years (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010; Chickering & Gamson, 1987; Marchese, 1997). The wealth of information about human learning and how that knowledge can be applied to enhance teaching can provide a solid foundation for understanding the teaching and learning process. Additionally, knowledge of learning theory can provide suggestions for general and specific applications to enhance teaching and student learning. Table 1.2 provides a brief summary of four theories of learning, how

Table 1.2   Theories of Learning Applied to University Teaching

Theory	General Applications to University Teaching	Specific Classroom Suggestions
Behavioral Learning Theory	• Consequences of behavior determine future behavior • Learning occurs in response to rewards, absence of rewards, or punishment • Positive consequences shape learning better than negative consequences	• Attention and reward patterns will influence learning behaviors • Reward good behavior rather than punish bad • Match reward level with task difficulty • Provide frequent and clear feedback
Information Processing Theory of Learning	• Information is processed in stages in the brain • Amount of information that can be processed is limited • Learning is an interactive process	• Teach class as series of mini-units • Chunk information into connected parts • Teach new material first then practice and review
Cognitive Theory of Learning	• Learning occurs through struggle with mental imbalance • Learner actively constructs knowledge	• Use discovery, active learning techniques (cooperative learning, discussion, hands-on experiments) • Create opportunities for mental critical thinking and mental conflict (debates, case studies)
Humanistic Learning Theory	• Learning involves affective as well as cognitive growth • Students have natural need for knowledge • Cognitive growth only after lower order needs met (i.e., safety, belonging, esteem)	• Move from teacher-centered to student-centered learning • Reduce threat in classroom • Build on successful learning experiences • Scaffold task difficulty pairing challenge with support • Provide opportunities for students to take responsibility for own learning (e.g., choosing assignments and assessments)

they can be applied to university teaching, and a few specific suggestions for what a faculty member can do in the classroom.

Understanding the impact of the situation in which learning takes place, the *learning context* in this model, can provide valuable knowledge to instructors. Learning does not occur in a vacuum; physical surroundings influence instructor as well as learner behaviors. Besides the obvious classroom variables such as seating plan, room size and design, and access to instructional technologies, the learning context can include general elements of the educational institution that can affect seminar administration, instructor selection processes, values and goals of the instructional program, course evaluation methods, and learner selection policies. Context also addresses the cultural and global diversity within which teaching and learning takes place. Cultural realities affect teaching and learning in ways that are crucial to understanding and enhancing their effectiveness.

A critical element in the design and delivery of effective instruction is the selection or creation of appropriate course content. The accuracy, difficulty level, organization, and meaning of *course content*, what is taught and learned, must be appropriate to the desired learning outcomes, the learners being taught, and the expertise of instructors.

The variable that draws instructor, learner, learning process, learning context, and content together is *instructional processes*, or pedagogy. How the content is taught, the choice of one teaching method over another, should be made after consideration of desired learning outcomes, a careful review of the evidence on the effectiveness of different teaching approaches, the prior knowledge and present needs of learners, the expertise of instructors, and the limits or advantages presented by the classroom context.

Conclusion

Models are useful devices to represent and organize information or processes that can then be used to improve or enhance the information or processes. Models have been used in the physical, natural, engineering, and computer sciences to help render complex phenomena understandable and nonobservable variables visible. Disciplines within social sciences such as economics or management have developed models to help understand, explain, and predict human behavior. Models can also be extremely useful to help understand and improve university teaching and learning. The use of a model such as those described in this chapter can enable university instructors to develop teaching and learning environments that capitalize on and integrate a holistic understanding of the multiple variables that encompass the learning process. In this way, faculty members can become maximally effective in facilitating the kind of knowledge needed for today students within today's global realities.

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PART II

Outcomes of Teaching and Learning