# The Psychology of Learning and the Art of Teaching

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What has recent psychological research taught us about learning and how can we best apply these findings to improve teaching and enhance student learning?

Research in neuroscience, cognitive psychology, and neurobiology and behavior identified several key factors validated by empirical research.

### Engagement

What are the factors that enhance or inhibit involvement in learning? Engagement tends to decline if an activity is motivated by the promise of a reward (as opposed to an intrinsic motivation, such as a desire to increase one's competence). Motivation is also reduced if individuals engage in more than one activity at a time, or if they attribute their failure to a lack of ability (rather than a lack of effort).

### Emotional Factors Affecting Cognition

Learners have distinct styles that influence learning. Especially important is whether a student has a prevention and promotion focus. A student with a prevention focus is especially sensitive to negative outcomes, seeks to avoid errors, and is driven by security concerns, while a student with a promotion focus is more sensitive to positive outcomes. Learning is enhanced when there is regulatory fit, when fit when the manner of in which a student engages in an activity sustains their goal orientation or interests regarding that activity.

### Grounded Cognition

Learning, memory, and reasoning are enhanced when students have the opportunity to perceive and interact with real-world examples. Thus, simulations and problem solving activities can play a valuable role in promoting understanding and recall.

### Mental Modeling

A mental model is a representation or a conceptualization of a larger reality which allows an individual to readily acquire, code, store, recall, and decode information. By allowing an individual to structure knowledge, mental models play a crucial role in cognition, recall, learning, and decisionmaking.

### The Zone of Proximal Development

The early 20th century developmental psychologist Lev Vygotsky wrote about "the zone of proximal development," a phrase that refers to the level of understanding that a student can reach with a teacher's help. Thus, an instructor seeks to stretch and broaden a students understanding (i.e. scaffold) by identifying those areas that are within a student's grasp: not too easy, but also not too difficult.

**Repeated Testing**
Testing can be a valuable learning tool. It can focus on evaluation, or it can be used in other ways: to motivate study, consolidate learning, combat overconfidence, and assist students in monitoring their own understanding. Testing enhances long-term memory and helps students retrieve and apply knowledge.

**Spacing**
Recent research has demonstrated that a student's ability to remember, retrieve, and utilize information is greater when an instructor's presentations of difficult material are spread out over time rather than concentrated intensively.

**Generation Effect**
Studies have shown that when students generate their own answers to a problem, their mastery of a topic is greater than when an instructor shows them how to solve a problem.

**Metacognition**
Metacognition refers to one's self-awareness of one's own thought processes. It also involves the ability to monitor comprehension and accurately evaluate one's learning. Metacognition helps students avoid distractions, sustain effort, and modify their learning strategies based on their awareness of the strategies' effectiveness. Strategies for encouraging metacognition include having students:
• Ask reflective questions;
• Recount their thought processes as they attempt to solve a problem; and
• Make graphic representations of their thoughts and knowledge (e.g. concept maps, flow charts, semantic webs).

We also explore recent findings on the psychological dynamics of the classroom.

**The Social Psychology of the Classroom**
That students fall into certain stereotypes—jocks, grinds, party animals—is part of the conventional wisdom. Among the roles students commonly adopt are the compliant, the annoyingly argumentative, the habitual rebels, and the discouraged and fatalistic. Other student types include careerists, intellectuals, strivers, and the disconnected. It is sometimes postulated that first and second generation immigrant students often fall into certain categories: assimilators, accommodators, and resisters.

**Student Learning Styles**
We frequently hear that students have disparate learning styles: That some are auditory learners, while others are visual or tactile or kinesthetic learners (who learn by manipulating objects or engaging in projects) or analytical learners (or prefer information presented in sequential steps), or global learners (who do not like to be bored and prefer various kinds of stimulation). Then there are other learning styles: competitive, collaborative, independent, dependent, participatory, resistant, and avoidant. Rather than placing students in rigid categories, it appears that most students learn in multiple ways and that it is best, therefore, to present information in multiple ways.

**Learning and Students' Psychosocial Development**
Students' psychological development does not end at adolescence. Indeed, it is clear that the college years are just as important in students' cognitive, emotional, moral, and social development. How does college affect students? It influences their verbal, quantitative, and subject matter competence, their cognitive skills, their identity, self-concept, and self-esteem, and values and attitudes.

• The peer group is the single most important source of influence on students' development: on personality development, attitudes and values, behavior patterns, career development, and satisfaction with college.

• The extent of peer interaction is strongly connected to overall satisfaction with college.

• Women's attendance at women's colleges and African American students attendance at predominantly black colleges is positively related to success and achievement in later life.

• The degree to which faculty are student oriented is second only to the influence of the peer group on students' growth. Measures include interactions outside of class, student engagement in research under a faculty members' supervision, and feedback on papers.

• Active learning—including class presentations, group projects, and discussion—and substantive projects also have positive effects on students' growth.

In preparation for Year 2, we began to explore applications of the psychology of learning to classroom teaching. Successful teaching, we concluded, involves much more than the transmission of skills and content. Our ultimate goal is to nurture independent, self-directed, self-motivated learners who are capable of directing and critiquing their own work, who are open to alternate viewpoints, and who have highly developed higher-order skills in interpretation, analysis, and communication.

As an instructor, one of our most important tasks is to guide, motivate, and assist students through this maturational process. Students must recognize the limits of their current skills, knowledge, and perspectives.  They must realize that approaches rewarded in high school—such as rote memorization, the mechanical use of formulas, or the parroting back of ideas from a textbook—are no longer sufficient in college, where a premium is placed on originality, high-level analytical skills, and facility in writing.

Teaching can be didactic, emphasizing the transfer of information.  It can be philetic, in which the teacher serves as role model and mentor.  It can be evocative, assisting students in discovering the personal meaning of a topic or text, rather than seeking some larger truth. Then there is heuristic teaching, which engages students in a process of inquiry and discovery to help them develop the habits of a particular discipline.

**From Transactional to Transformational Teaching**
Transactional teaching involves the transmission of knowledge from teacher to students.  Students are expected to assimilate and synthesize the new knowledge on their own. Transformational teaching, in contrast, is much more self-conscious about its objectives and methods. It adopts a learner-centered rather than an instructor-centered approach.  It makes students privy to the instructor's larger goals and expectations. It prepares students to understand that they will receive challenging feedback.  It cultivates reflective learning by giving students opportunities to reflect on the learning process.  It gives students assignments that they find meaningful, involving case studies, real-world data and problems, research and inquiry, and the public display of their findings.

**Teaching as a Developmental Process**
Learning involves a process of personal transformation. It requires students to develop a capacity for self-direction, self-monitoring, and self-generation of ideas. In order to mature as a learner, a student must shed earlier ways of thinking and earlier forms of self-expression. Because the process of intellectual maturation involves fundamental transformations in a student's self-perception and thinking, it is often emotionally wrenching.

**Conceptual Learning**
We typically think of learning as the acquisition and application of knowledge. Even when we think of higher-order thinking skills—analysis, synthesis, and evaluation—we cling to a functionalist view of learning.  But advanced learning requires more: That students construct a conceptual framework that allows them to integrate and organize knew knowledge into a coherent structure.

To foster deep learning, instructors need to nurture creative and unconventional thinkers who are skeptical about the received wisdom and capable of challenging existing assumptions and paradigms.  This involves cultivating:
▪ intellectual curiosity (or what is often called "intrinsic motivation")
▪ intellectual independence (an unwillingness to accept any idea or conclusion on faith), and
▪ an interest in grappling with the aesthetic, ethical, political, and social implications of ideas.

Deep learning entails examining facts and ideas critically, relating new and older knowledge, linking ideas together, and constructing novel conceptual structures. It involves the ability to place isolated, unlinked facts into larger conceptual structures.

Conceptual thinking means something quite different than the learning of skills or the mastery of content and concepts. It involves the discovery of meaningful patterns, the formulation of generations, and constructing arguments that are located in a larger disciplinary conversation.

**The Classroom as a Site of Interpersonal Interaction**
Learning generally does not take place in isolation. Rather, learning involves interpersonal interactions in a social setting. Therefore we need to pay close attention to the psycho-social and emotional dimensions of learning. The psycho-social aspects of learning have been a particular concern among feminist pedagogues, who argue that learning is context sensitive. Proponents of feminist pedagogies view the classroom as a site of power, privilege, and hierarchy, and regard teaching as an inherently political act. Yet the politics of the classroom, these scholars maintain, remain obfuscated.

Within the traditional classroom, these scholars argue, certain ideas, perspectives, and forms of behavior, discourse, and argumentation are favored. The conceptual design of a course tends to remain hidden and unexamined, while the selection of topics and readings reflects unspoken ideological presumptions. Meanwhile the approach to teaching in the traditional classroom, whether involving lecture or discussion, takes the significance of a particular text or topic for granted and fails to model the range of alternate interpretive or analytical approaches. All of these factors lead some, if not many, students to feel marginalized, discouraging deep learning.

**Teaching for Inclusion**
Today's college classrooms are more diverse than ever. Only 16 percent of college students can be described as "traditional": entering college right out of high school, attending full-time, and living on campus. A fifth of college students are immigrants or the children of immigrants, a third are students of color, and a tenth have a diagnosed disability.

Student learning can be enhanced or hindered by the classroom environment. A safe, inclusive, and stimulating environment encourages students to actively participate. Fostering such an environment requires an instructor to be acutely sensitive to individual differences and make sure that students understand the instructor's expectations and goals, as well as the steps the student must take to meet these objectives. In addition to promoting sensitivity, an inclusive classroom encourages dialogue, a process that might include collaborative inquiry, peer criticism, and intellectual give-and-take.

## Psychological Principles and Classroom Practice
▪ Student learning is maximized:
▪ When information is presented in multiple ways.
▪ When students are engaged, motivated, and actively participating.
▪ When your learning objectives are closely connected to your methods of assessment.
▪ When your expectations are clear.
▪ When you model or scaffold learning in your discipline.
▪ When you involve students in formulating inquiries and reflecting upon their learning.

## Best Practices and New Practices

**R-Courses:** These are research oriented courses that emphasize "bounded inquiry." The purpose is to encourage students to think like an anthropologist, biologist, chemist, literary critic, political scientist, sociologist, or statistician. Components typically include reviewing and critiquing journal articles, providing students with data sets, and having students make hypotheses and test them.

**Encouraging Student Reflection:** Specially-designed assignments encourage various forms of student reflection, leading students to assess their knowledge and reflect critically upon their assumptions and perspectives. These include reflection upon content and concepts, personal reflection (description of reactions, thoughts, and feelings), and metacognitive reflection (monitoring of one's own thought processes).