# EDUCATIONAL PSYCHOLOGY

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**Session 9**

**How people learn- learning styles-mastery learning- intelligent quotient**

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The University of Washington, Stanford University, and SRI International received funding from the NSF for a five-year research center on the science of learning. The LIFE Center seeks to understand and advance human learning through a simultaneous focus on implicit, informal, and formal learning, thus cultivating generalizable interdisciplinary theories that can guide the design of effective new technologies and learning environments.

Previously, Dr. Bransford was Centennial Professor of Psychology and Education and Co-Director of the Learning Technology Center at Vanderbilt University. Early works by Bransford and his colleagues in the 1970s included research in the areas of human learning, memory and problem solving, which helped shape the "cognitive revolution" in psychology. Author of seven books and hundreds of articles and presentations, Bransford is an internationally renowned scholar in cognition and technology.

In 1984 Bransford was asked by the Dean of Peabody College at Vanderbilt to help begin a Learning Technology Center that would focus on education. The Center grew from 7 people in 1984 to approximately 100 by 1999. During that time, Bransford and his colleagues developed and tested a number of innovative computer, videodisc, CD-Rom, and Internet programs for mathematics, science, and literacy. Examples include the Jasper Woodbury Problem Solving Series in Mathematics, the Scientists in Action Series, and the Little Planet Literacy Series. Many of these programs are being used in schools throughout the world. Bransford's dissertation won honorable mention in the national "Creative Talent Awards" contest; several of his published articles (co-authored with colleagues) have won "article of the year" in the areas of science education, technology, design, and theories of transfer. The Little Planet Literacy Series, has won major awards including the 1996 Technology and Learning Award and the 1997 Cody award for Best Elementary Curriculum from the Software Publishers Association. Bransford received the Sutherland Prize for Research at Vanderbilt, was elected to the National Academy of Education, and was awarded the Thorndike award in 2001. In 2003, Bransford received the highest honor within the Teaching of Physiology section of the American Physiological Society: he was selected to present the Claude Bernard Lecture during the Experimental Biology Meeting.

Bransford served as Co-Chair of several National Academy of Science committees. These committees wrote How Students Learn: History, Mathematics, and Science in the Classroom (2005),[1] How People Learn: Brain, Mind, Experience and School (2000),[2] and How People Learn: Bridging Research and Practice (1999).[3] Recently, he co-edited, with Linda Darling-Hammond, Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able to Do (2005).[4] He is on the International and United States Board of Advisors for Microsoft's

Partners in Learning program, and he has worked with the Gates Foundation to develop technology-enhanced workshops that link learning and leadership.

# Learning styles

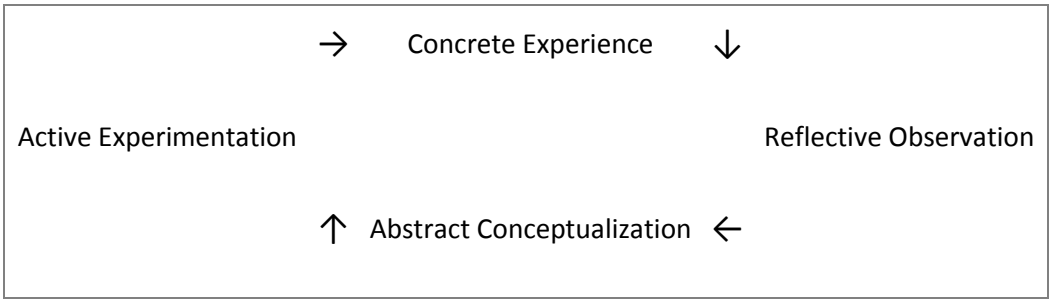
**Learning styles** encompass a series of theories suggesting systematic differences in individuals' natural or habitual pattern of acquiring and processing information in learning situations. A core concept is that individuals differ in how they learn.[1] The idea of individualized learning styles originated in the 1970s, and has greatly influenced education.[2]

Proponents of the use of learning styles in education recommend that teachers assess the learning styles of their students and adapt their classroom methods to best fit each student's learning style. Although there is ample evidence that individuals express preferences for how they prefer to receive information, few studies have found any validity in using learning styles in education.[2] Critics say there is no evidence that identifying an individual student's learning style produces better outcomes. There is evidence of empirical and pedagogical problems related to the use of learning tasks to "correspond to differences in a one-to-one fashion".[3] Well-designed studies contradict the widespread "meshing hypothesis", that a student will learn best if taught in a method deemed appropriate for the student's learning style.

## David Kolb's model[

David A. Kolb's model is based on the Experiential learning Theory, as explained in his book *Experiential Learning*.[4] The ELT model outlines two related approaches toward grasping experience: **Concrete Experience** and **Abstract Conceptualization**, as well as two related approaches toward transforming experience: **Reflective Observation** and **Active Experimentation**. According to Kolb's model, the ideal learning process engages all four of these modes in response to situational demands. In order for learning to be effective, all four of these approaches must be incorporated. As individuals attempt to use all four approaches, however, they tend to develop strengths in one experience-grasping approach and one experience-transforming approach. The resulting learning styles are combinations of the individual's preferred approaches. These learning styles are as follows:

**David Kolb's Experiential Learning Model (ELM)**[5]




1. Accommodators: Concrete Experience + Active Experiment

- "Hands-on" and concrete
- Wants to do
- Discovery method
- Sets objectives/schedules
- Asks questions fearlessly
- Challenges theories
- Adaptable
- Receive information from others
- Gut feeling rather than logic

2. Converger: Abstract Conceptualization + Active Experiment

- "Hands-on" and theory
- Analogies
- Specific problems
- Tests hypothesis
- Best answer
- Works alone
- Problem solving
- Technical over interpersonal

3. Diverger: Concrete Experience + Reflective Observation

- Real life experience and discussion
- Imaginative
- More than one possible solution
- Brainstorming and groupwork
- Observe rather than do
- Alternatives
- Background information

4. Assimilator: Abstract Conceptualization + Reflective Observation

- Theories and facts
- Theoretical models and graphs
- Talk about rationale rather than do
- Lectures
- Numbers
- Defines problems
- Logical Formats[6]

Kolb's model gave rise to the Learning Style Inventory, an assessment method used to determine an individual's learning style. An individual may exhibit a preference for one of the four styles—Accommodating, Converging, Diverging and Assimilating—depending on their approach to learning via the experiential learning theory model.[4]

Although Kolb's model is the most widely accepted with substantial empirical support, recent studies suggest the Learning Style Inventory (LSI) is seriously flawed [7]

## Learning Modalities

"Sensory preferences influence the ways in which students learn ... Perceptual preferences affect more than 70 percent of school-age youngsters" (Dunn, Beaudry, & Klavas, 1989, p. 52). There are three Learning Modalities adapted from Barbe, Swassing, and Milone:[8]

1. Visualising style

2. Auditory style

3. Tactile (Kinesthetic)style

**Descriptions of Learning Modalities:**

| Visual | Kinesthetic | Auditory |
|---|---|---|
| Picture | Gestures | Listening |
| Shape | Body Movements | Rhythms |
| Sculpture | Object Manipulation | Tone |
| Paintings | Positioning | Chants |

Learning modalities can occur independently or in combination, changing over time, and becoming integrated with age.[9]

## Peter Honey and Alan Mumford's model[

Two adaptations were made to Kolb's experiential model. Firstly, the stages in the cycle were renamed to accord with managerial experiences of decision making/problem solving. The Honey & Mumford stages are:

1. Activist
2. Reflector
3. Theorist
4. Pragmatist

Secondly, the styles were directly aligned to the stages in the cycle and named **Activist**, **Reflector**, **Theorist** and **Pragmatist**. These are assumed to be acquired preferences that are adaptable, either at will or through changed circumstances, rather than being fixed personality

characteristics. The Honey & Mumford *Learning Styles Questionnaire* (LSQ)[10] is a self-development tool and differs from Kolb's Learning Style inventory by inviting managers to complete a checklist of work-related behaviours without directly asking managers how they learn. Having completed the self-assessment, managers are encouraged to focus on strengthening underutilised styles in order to become better equipped to learn from a wide range of everyday experiences.

A MORI survey commissioned by The Campaign for Learning[11] in 1999 found the Honey & Mumford LSQ to be the most widely used system for assessing preferred learning styles in the local government sector in the UK.

### Anthony Gregorc's model

Maria Bagby discusses the work of Anthony F. Gregorc and Kathleen A. Butler in her article entitled *Learning Style Difference vs Learning Difficulty*. Gregorc and Butler worked to organize a model describing different learning styles rooted in the way individuals acquire and process information differently.[12] This model is based on the existence of perceptions—our evaluation of the world by means of an approach that makes sense to us. These perceptions in turn are the foundation of our specific learning strengths, or learning styles.

In this model, there are two perceptual qualities 1) concrete and 2) abstract; and two ordering abilities 1) random and 2) sequential.[12] Concrete perceptions involve registering information through the five senses, while abstract perceptions involve the understanding of ideas, qualities, and concepts which cannot be seen. In regard to the two ordering abilities, sequential involves the organization of information in a linear, logical way and random involves the organization of information in chunks and in no specific order.[12] Both of the perceptual qualities and both of the ordering abilities are present in each individual, but some qualities and ordering abilities are more dominant within certain individuals.

There are four combinations of perceptual qualities and ordering abilities based on dominance: 1) Concrete Sequential; 2) Abstract Random; 3) Abstract Sequential; 4) Concrete Random. Individuals with different combinations learn in different ways—they have different strengths, different things make sense to them, different things are difficult for them, and they ask different questions throughout the learning process.[12]

# Mastery learning

There is a school of thought that presumes all children can learn if they are provided with the appropriate learning conditions. **Learning for mastery** or **mastery learning**, are terms coined by Benjamin Bloom in 1968 and 1971 respectively. Bloom hypothesized that a classroom with a mastery learning focus as opposed to the traditional form of instruction would reduce the achievement gaps between varying groups of students (Guskey 2007). In Mastery learning, "the

students are helped to master each learning unit before proceeding to a more advanced learning task" (Bloom 1985) in contrast to "conventional instruction".

Mastery learning has little to do with specific content, but rather is a description of the process of mastering particular learning objectives. This approach is based on Benjamin Bloom's Mastery for Learning model, with refinements made by Block. Mastery learning may be implemented as teacher-paced group instruction, one-to-one tutoring, or self-paced learning with programmed materials. It may involve direct teacher instruction, cooperation with classmates, or independent learning. It requires well-defined learning objectives organized into smaller, sequentially organized units. Individualized instruction has some elements in common with mastery learning, although it dispenses with group activities in favor of allowing more able or more motivated students to progress ahead of others and maximizing teacher interaction with those students who need the most assistance.

In one meta-analysis (Kulik, Kulik & Bangert-Drowns, 1990), the mean effect size (Cohen's d) of 103 studies was 0.52, which is considered a moderately large effect size.

The concept of mastery learning can be attributed to the behaviorism principles of operant conditioning. According to operant conditioning theory, learning occurs when an association is formed between a stimulus and response (Skinner, 1984). In line with the behavior theory, mastery learning focuses on overt behaviors that can be observed and measured (Baum, 2005). The material that will be taught to mastery is broken down into small discrete lessons that follow a logical progression. In order to demonstrate mastery over each lesson, students must be able to overtly show evidence of understanding of the material before moving to the next lesson (Anderson, 2000).

In 2008, Jon Bergmann and Aaron Sams began to embrace what they call the Flipped-Mastery model. This is mastery learning that used technology to time-shift the individual instruction. They created videos for each learning objective and posted these online so that as students moved through the content, they were able to move at their own pace. Technology freed up the teachers to individualize the learning for each student. (Bergmann, Sams 2012)

## Assessment in mastery learning

In a mastery learning environment, the teacher directs a variety of group-based instructional techniques, with frequent and specific feedback by using diagnostic, formative tests, as well as regularly correcting mistakes students make along their learning path. Assessment in the mastery learning classroom is not used as a measure of accountability but rather as a source of evidence to guide future instruction. A teacher using the mastery approach will use the evidence generated from his or her assessment to modify activities to best serve each student. Teachers evaluate students with criterion-referenced tests rather than norm-referenced tests. In this sense, students are not competing against each other, but rather competing against themselves in order to achieve a personal best.

## Application[

What does a mastery learning classroom look like? Mastery learning curricula generally consists of discrete topics which all students begin together. After beginning a unit, students will be given a meaningful and formative assessment so that the teacher can conclude whether or not an objective has been mastered. At this step, instruction goes in one of two directions. If a student has mastered an objective, he or she will begin on a path of enrichment activities that correspond to and build upon the original objective. Students who do not satisfactorily complete a topic are given additional instruction until they succeed. If a student does not demonstrate that he or she has mastered the objective, then a series of correctives will be employed. These correctives can include varying activities, individualized instruction, and additional time to complete assignments (Guskey 2007). These students will receive constructive feedback on their work and will be encouraged to revise and revisit their assignment until the objective is mastered.

## Criticism[

In general, mastery learning programs have been shown to lead to higher achievement in all students as compared to more traditional forms of teaching (Anderson, 2000; Guskey & Gates, 1986). Despite the empirical evidence, many mastery programs in schools have been replaced by more traditional forms of instruction due to the level of commitment required by the teacher and the difficulty in managing the classroom when each student is following an individual course of learning (Anderson, 2000; Grittner, 1975). Despite the conclusive evidence that an appropriately instituted mastery approach to instruction yields improvement in student achievement, there is a strong movement against it. Critics of mastery learning often point to time constraints as a flaw in the approach. Those that favor breadth of knowledge over depth of knowledge may feel that it is more important to "cover" a lot of material with little detail rather than focus more energy on ensuring that all students achieve learning goals. Many teachers are hesitant to institute a mastery learning approach in their classroom because of fears that they may get behind in their lessons. Some critics argue that allowing some students extra time to complete their work is unfair. They argue that differentiated instruction is inherently unfair because the students who receive extra feedback and time are somehow given an advantage over the students who master the objectives the first time. Most of this criticism stems from a misunderstanding of Bloom's approach.[*dubious* – *discuss*] In Bloom's ideal classroom, the institution of a mastery learning approach is postulated to eventually lead to a drastic decline in the variation of student achievement, as Students who require more correctives initially would "gain direct evidence of the personal benefits the process offers" (Guskey 2007) and thus they eventually come to employ these varying strategies and techniques on their own, while those students who receive less will make slower progress. As the gap in student achievement shrinks, more time will be devoted to "enrichment activities" for all students than corrective activities (Guskey 2007).

# Intelligence quotient

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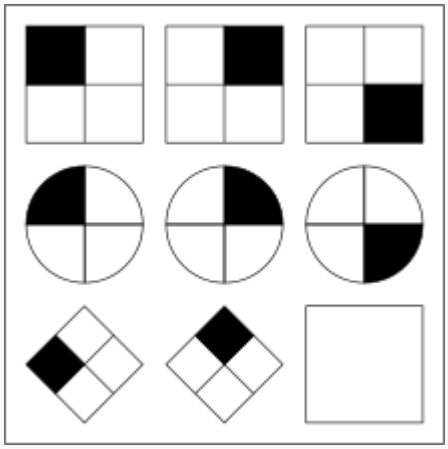
*"IQ" redirects here. For other uses, see IQ (disambiguation).*

| Intelligence quotient | |
|---|---|
| *Diagnostics* | |
|  | |
| An example of one kind of IQ test item, modeled after items in the Raven's Progressive Matrices test | |
| **ICD-9-CM** | 94.01 |
| **MedlinePlus** | 001912 |

An **intelligence quotient,** or **IQ,** is a score derived from one of several standardized tests designed to assess human intelligence. The abbreviation "IQ" was coined by the psychologist William Stern for the German term *Intelligenz-quotient*, his term for a scoring method for intelligence tests he advocated in a 1912 book.[1] When current IQ tests are developed, the median raw score of the norming sample is defined as IQ 100 and scores each standard deviation (SD) up or down are defined as 15 IQ points greater or less, although this was not always so historically.[2] By this definition, approximately 95 percent of the population scores an IQ between 70 and 130, which is within two standard deviations of the mean.

IQ scores have been shown to be associated with such factors as morbidity and mortality,[3][4] parental social status,[5] and, to a substantial degree, biological parental IQ. While the heritability of IQ has been investigated for nearly a century, there is still debate about the significance of heritability estimates[6][7] and the mechanisms of inheritance.[8]

IQ scores are used as predictors of educational achievement, special needs, job performance and income. They are also used to study IQ distributions in populations and the correlations between IQ and other variables. Raw scores on IQ tests for many populations have been rising at an average rate that scales to three IQ points per decade since the early 20th century, a phenomenon

called the Flynn effect. Investigation of different patterns of increases in subtest scores can also inform current research on human intelligence

### Early history[

The English statistician Francis Galton made the first attempt at creating a standardised test for rating a person's intelligence. A pioneer of psychometrics and the application of statistical methods to the study of human diversity and the heritability of intelligence, he believed that intelligence was largely a product of heredity (by which he did not mean genes, although he did develop several pre-Mendelian theories of particulate inheritance).[9] He hypothesized that there should exist a correlation between intelligence and other desirable traits like good reflexes, muscle grip, and head size.[10] He set up the first mental testing centre in the world in 1882 and he published "Inquiries into Human Faculty and Its Development" in 1883, in which he set out his theories. After gathering data on a variety of physical variables, he was unable to show any such correlation, and he eventually abandoned this research.[11][12]

French psychologist Alfred Binet was one of the key developers of what later became known as the Stanford–Binet test.

French psychologist Alfred Binet, together with Victor Henri and Théodore Simon had more success in 1905, when they published the Binet-Simon test in 1905, which focused on verbal abilities. It was intended to identify mental retardation in school children,[11] but in specific contradistinction to claims made by psychiatrists that these children were "sick" (not "slow") and should therefore be removed from school and cared-for in asylums.[13]

The score on the Binet-Simon scale would reveal the child's mental age. For example, a six-year-old child who passed all the tasks usually passed by six-year-olds—but nothing beyond—would have a mental age that matched his chronological age, 6.0. (Fancher, 1985). Binet thought that intelligence was multifaceted, but came under the control of practical judgement.

> There is in intelligence, it seems to us, a fundamental agency the lack or alteration of which has the greatest importance for practical life; that is judgment, otherwise known as good sense, practical sense, initiative, or the faculty of adapting oneself.... Compared to judgment the rest of the psychology of the intellect seems of little importance.[14]

In Binet's view, there were limitations with the scale and he stressed what he saw as the remarkable diversity of intelligence and the subsequent need to study it using qualitative, as opposed to quantitative, measures (White, 2000). American psychologist Henry H. Goddard published a translation of it in 1910. American psychologist Lewis Terman at Stanford University revised the Binet-Simon scale, which resulted in the Stanford-Binet Intelligence Scales (1916). It became the most popular test in the United States for decades.[