

3.2 | Evaluate: Individual Differences to Address

When designing instruction, it is important to distinguish between individual differences in learner characteristics that are supported by evidence and those that are not. Although frameworks such as cognitive styles, learning styles, and multiple intelligences remain popular, research has found insufficient evidence to support their use as a basis for instructional decision-making. In contrast, well-established individual differences, such as learners' prior knowledge, motivational goal orientation, and general intellectual ability, have demonstrated significant, positive effects for learning (Clark & Feldon, 2005).

That said, it is important to be aware of popular but weakly supported categories of individual differences. Being able to distinguish evidence-based factors from unsupported ones enables you to justify both your design choices and your decisions to exclude consideration of certain factors. The three main categories that we'll address include **multiple intelligences**, **learning styles**, and **cognitive styles**. Following a brief description of each, we'll provide descriptions of various categories and inventories that you may encounter.

Multiple Intelligences

Harvard educational psychologist Howard Gardner (1983) proposed the Theory of Multiple Intelligences (1983, 1999) based on his research with brain-damaged individuals, hypothesizing that there are eight different kinds of intelligence, each with a corresponding section of the brain. Here are the eight intelligences, plus a ninth that he refers to as a "half-intelligence" (because it doesn't fully meet his criteria) include:

- Verbal-Linguistic
- Logical-Mathematical
- Musical
- Spatial
- Bodily-Kinesthetic
- Interpersonal
- Intrapersonal
- Naturalistic
- Existential (a "half-intelligence")

Gardner proposed that intelligence is not a single, fixed ability but rather a set of distinct capacities that enable individuals to process information and demonstrate understanding. Each intelligence represents a different way of knowing and engaging with the world, such as through language, logical reasoning, social interaction, self-reflection, or sensory and physical experience. The theory has been influential in education because it challenges traditional views of intelligence centered on verbal and mathematical ability and encourages broader recognition of learners' diverse strengths.

Although Gardner's Theory of Multiple Intelligences has influenced educational practice, many researchers have cautioned against using it to classify learners or to tailor instruction to presumed



intelligence types. Evidence does not support the effectiveness of matching instruction to learning styles or intelligence categories, and such approaches may oversimplify cognition and constrain learning (de Bruyckere et al., 2015, 2019; Waterhouse, 2006). Additionally, there is a danger that educators may design instruction based on their own dominant intelligences and inadvertently privilege certain approaches that benefit learners with similar strengths while disadvantaging others. However, incorporating multiple representations and ways of engaging with content can enrich learning when grounded in established cognitive principles rather than typologies. This can be done by mindfully incorporating the research-based Universal Design for Learning (UDL) principles in your instructional designs: multiple means of engagement, representation, and action and expression.

Learning Styles

There are many in education and business who advocate the practice of designing instruction to the *preferred learning styles* of individuals. However, as noted, researchers emphasize that “no solid evidence exists showing that there is any benefit to adapting and designing education and instruction to these so-called styles” (De Bruyckere et al., 2015, p. 26). In addition, Clark (1983) found that allowing learners to choose instruction based on their preferred learning style does not necessarily lead to improved learning outcomes and, in some cases, may even hinder learning. (See also Clark & Feldon, 2005; Kirschner, 2017; Kirschner & van Merriënboer, 2013.)

Cognitive Styles

Cognitive styles are inherent and stable traits that influence a person’s characteristic mode of perceiving, thinking, remembering, and problem solving. While sometimes used interchangeably with the term **learning styles**, the latter refers to an individual's preferred way of absorbing, processing, and retaining information. Many researchers agree that people have different styles of thinking and learning, but they disagree over claims as to whether these styles “can be measured reliably using currently available instruments, and that tailoring instruction to match these styles (by whatever learning styles measure) improves classroom learning performance” (Terry, 2001, p. 70). Consequently, cognitive styles and learning styles do not provide a solid basis for addressing individual differences in your instructional designs.

An Overview of Cognitive Style Constructs & Learning Style Models

There are many cognitive style constructs and learning style models with new ones regularly proposed. The topic is broad with little agreement on the total number of styles or their significance. Jonassen (1991, 1993) described cognitive styles as relatively stable, habitual ways that individuals prefer to perceive, process, and organize information, particularly in learning and problem-solving contexts. He emphasized that they are not measures of ability or intelligence, but patterns of preference that influence how learners interact with different types of tasks and instructional environments. Jonassen was critical of how cognitive styles are often overgeneralized or used prescriptively; he argued that their instructional value depends on the context and the nature of the task, and that it is impossible to assume a fixed match between a learner’s style and a single “best” instructional strategy.

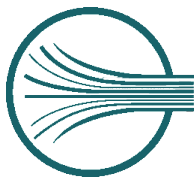


Table 1 describes four of the most well-known and researched cognitive style constructs: field dependence/independence, locus of control, cognitive tempo, and preferred perceptual modalities. Each has been used as the justification for instructional design decisions, and all continue to be controversial in terms of their effects on learning (Tiedemann, 1989).

Table 1. Four Cognitive Styles or Constructs

The following descriptions of styles theories and models are adapted from a variety of sources, cited below. See Coffield, et al (2004) for more information and resources.

Field Dependence / Field Independence
The cognitive style of field dependence/independence was introduced by Herman Witkin in 1954 and is one of the most extensively researched cognitive styles (Jonassen & Grabowski, 1993). It refers to the degree to which an individual's perception is influenced by surrounding context (Witkin, Moore, Goodenough, & Cox, 1977). • Field-dependent (FD) individuals rely more on external cues and context, often finding it difficult to isolate relevant information, whereas • Field-independent (FI) individuals are more analytical and able to distinguish key information from background "noise." Researchers have extended this distinction to learning and social behavior. FD learners tend to prefer structure, guidance, and collaboration, while FI learners are more comfortable with autonomy, less structured tasks, and analytic problem-solving. These differences influence strategy use: FD learners may struggle with ill-structured problems and open-ended tasks, whereas FI learners more easily filter irrelevant information and navigate complexity (Liu & Reed, 1994; Valencia-Vallejo et al., 2019). Witkin's Group Embedded Figures Test (GEFT) was developed to measure this construct, though it has been criticized for conflating cognitive style with ability (Grigorenko & Sternberg, 1995). Research provides several implications of field dependence/independence for instruction (Jonassen & Grabowski, pp. 97-98): • Instructionally, FD learners benefit from clear structure, explicit guidance, and gradual removal of supports (removing the structure, then the cues, and then the feedback), and matching features of the instructional materials to the key objectives. • FI learners benefit from opportunities for self-direction, selective attention, and tasks that require managing complexity.
Locus of Control
This term refers to an individual's feelings and beliefs about who has responsibility and control over his/her life, and the causes of their success or failure. Those with an internal locus of control typically attribute the cause of success or failure to themselves. Those with an external locus of control tend to attribute success or failure to external forces (others, luck, easy or hard tasks, help or lack of help, etc.). Research provides several implications for instruction (Jonassen & Grabowski, pp. 360-361): • Instructional conditions that help externals include structured lessons, deductive activities, cued instruction. • Instructional conditions that help internals include having them work under observation rather than isolation; and small group work where high-ability students teach low-ability students.
Cognitive Tempo (Reflection / Impulsivity)
This term refers to the level of an individual's reflection and impulsivity, or "a person's tendency to inhibit initial responses and reflect on the accuracy of an answer rather than the tendency to respond impulsively" (Jonassen & Grabowski, 1993, p. 113). Research provides several implications for instruction (Jonassen & Grabowski, pp. 118-120): • Students become more reflective after observing reflective adult models. • Impulsive students' impulsivity decreases with rewards & increases without rewards, while reflective learners are generally unaffected by rewards. • Explicit teaching of reflective test strategies can enhance the recall test performance of impulsive students.



- Students tending toward impulsivity typically are deficient in meta-cognitive skills such as awareness of task objectives, planning & evaluating strategies, & ability to monitor progress. These issues can cause inefficiency in problem-solving.

Perceptual Modalities

In the early 1970's, Dr. Russell French of the University of Tennessee in Knoxville formulated a framework of perceptual learning styles. Eventually French and others formed the Institute for Learning Styles Research (ILSR) and developed the Multi-Modal Paired Associates Learning Test (MMPALT) to help learners discover their perceptual strengths and preferences. The Visual-Auditory-Kinesthetic-Tactile (VAKT) and Visual-Aural-Read/Write-Kinesthetic (VARK) teaching methods have been developed to address the theory of preferred learning styles aligning with the perceptual modalities. Research provides several implications for instruction (Jonassen & Grabowski, pp. 185-186, 197-198):

- Visual students benefit from image-related instructional sequences (images, pictures, graphs, charts, high-imagery materials, graphic organizers); deductive (general-to-detailed) sequencing; multisensory training with tactile activities; concrete to abstract instruction.
- Haptic students benefit from multisensory training with visual manipulation activities; simultaneous presentation of visual images.
- Verbal students benefit from verbal presentations such as lectures, tapes, and non-illustrated texts.

Table 2. Thirteen Models of Learning Styles

Table 2 provides descriptions of 13 models of learning styles (a.k.a., “learning preferences”). In a critical review and analysis for post-16 educational purposes, Coffield and colleagues (2004) identified 71 models of learning styles, selecting 13 to analyze on the basis of their influence. Of the 13 models examined, Coffield and others (2004) found that only the Allinson and Hayes model met all four of their criteria for reliability and validity. Two other models – the Vermunt and Herrmann models – met three of their four criteria. As a result, they concluded:

All teacher–student interactions in post-16 learning are embedded in structures of power, regulation and control. These mean, for instance, that neither teachers nor students have the total freedom to choose the teaching or learning strategies which they may wish to adopt. There are also so many constraints on teachers and so many variables affecting learning outcomes that the differences produced through approaches based on learning styles are likely to be rather small (pp. 14-15).

The authors of the study also conceded that learning styles instruments may be useful to learners and instructors by prompting both to become more meta-cognitively aware of their own learning (and teaching) styles. This knowledge would then equip educators to improve their practice, and learners to enhance their strategies and success in learning.

Allinson & Hayes' Cognitive Style Index (CSI)

The CSI is a self-report test designed to measure the whole/part-processing dimension of cognitive style. It is designed for use with adults with an intuition-analysis dimension that Coffield and colleagues (2004) recommended be treated as a measure of two factors rather than one, since both intuition and analysis are relevant to decision making and work performance in many contexts. Reviewers concluded that CSI provides the best reliability and validity evidence of all 13 models analyzed.

Apter's Motivational Style Profile (MSP)

This is a personality profile instrument that seeks to provide insight into what is driving personal behavior and competence. MSP is based on Reversal Theory, which focuses on how people regularly reverse between psychological



states, reflecting on their motivational style and the meaning they attach to any given situation at any given time. Four domains of experience are involved that are each associated with a pair of motivations: means-ends (motivated by achievement & future goals, or by enjoyment of the process in the moment), rules (motivated by operating within other's rules & expectations, or by being rebellious against these structures), transactions (motivated by transacting power & control, or by care & compassion), and relationships (motivated by self interests, or by the interests of others). Interactions occur in each of these domains between emotion, cognition, and volition. Coffield and colleagues (2004) indicate that reliability and validity levels are good but that more research is needed, especially in educational contexts.

Dunn & Dunn's model & instruments of learning styles

This is a very popular model commercially that measures high and low preferences for factors in the areas of motivation, social interaction, and physiology and environment. Coffield & colleagues (2004) state there is a lack of independent research on the model, and supporters' claims of implications for pedagogy may go too far.

Entwistle's Approaches & Study Skills Inventory for Students (ASSIST)

The model assesses study/learning orientations, approaches to learning, study strategies, intellectual development skills and attitudes in higher education.

Gregorc's Mind Styles Model & Style Delineator (GSD)

With the GSD self-assessment instrument, individuals rank 40 descriptive words by how closely they match their thinking style. Results rank the individual into four thinking types: concrete sequential (realistic, processing information in an ordered, sequential, linear way), concrete random (experimenters), abstract random (organizes information through reflection & thrive in unstructured, people-oriented environments), and abstract sequential (love the world of theory & abstract thought). Coffield and associates (2004) warn that the model is not suitable for assessing individuals due to theoretic and psychometric flaws.

Herrmann's Brain Dominance Instrument (HBDI)

The HBDI is a self-report instrument that classifies four modes of thinking based on the task-specialized functioning of the brain: left cerebral (logical, analytical, quantitative, factual, critical), left limbic (sequential, organized, planned, detailed, structured), right limbic (emotional, interpersonal, sensory, kinesthetic, structured), and right cerebral (visual, holistic, innovative). It is well established in business. Coffield and colleagues (2004) state it is "a model which, although largely ignored in academic research, offers considerable promise for use in education and training. It is more inclusive and systemic than many others, taking an optimistic, open and non-labeling stance towards the development of people and organizations" (p. 27).

Honey & Mumford's Learning Styles Questionnaire (LSQ)

The LSQ is widely used in business, and is a checklist to be used by individuals to probe their attitudes and behaviors that determine learning preferences. It is based on Kolb's model with style preferences aligned to the four stages in the learning cycle. Coffield and colleagues (2004) state that it needs to be redesigned to overcome identified weaknesses.

Jackson's Learning Styles Profiler (LSP)

Coffield and associates (2004) give the LSP a positive review. It is theoretically sophisticated instrument designed for use in business and education, which describes four styles: Initiator, Analyst, Reasoner, and Implementer.



Kolb's Learning Style Inventory (LSI)

Kolb's inventory was an early learning styles instrument, based on experiential learning theory, which defines four styles of learning: active, reflective, abstract and concrete. Coffield and colleagues (2004) report that there are problems with reliability, validity and the learning cycle.

Myers-Briggs Type Indicator (MBTI)

The MBTI is a popular, multi-dimensional instrument for the measurement of personality style. It is based on psychologist Carl Jung's theory, positing 16 possible personality 'types.' Widely used in business & career counseling, Coffield and colleagues (2004) stress that more research is needed to determine which elements of the personality types are relevant for education. Note that many other personality instruments are used in a variety of career environments to screen job applicants with varying degrees of success. One criticism leveled at these tests is the potential effect of "social desirability bias," or the tendency of individuals to answer personality test questions according to what they think the administrators of those tests want to see. However, many personality tests are designed with consideration to issues of validity and reliability. The effects of social desirability bias have been debated for almost 50 years, but in general, the effects are believed to have less of an impact than originally thought (Ones & Viswesvaran, 1998; Paunonen & LeBell, 2012) (see full references below this chart).

Riding's Cognitive Styles Analysis (CSA)

The CSA is a 2-dimensional cognitive style computer-based instrument that measures individuals' position on two dimensions: Wholist-Analytic (indicating whether a person organizes and structures information using a global or overall view, or deconstructs it into component parts) and Verbal-Imagery (indicating whether a person represents information in memory as words or verbal associations, or as mental pictures. Coffield and colleagues (2004) indicate that the model has great potential but the CSA instrument is unreliable.

Sternberg's Thinking Styles Inventory (TSI)

Sternberg's inventory proposes 13 thinking styles and is based on a theory of mental self-government. Coffield and others (2004) report that there is very little evidence for reliability and validity of the instrument.

Vermunt's Inventory of Learning Styles (ILS)

The ILS emphasizes the whole teaching-learning environment and has been used to study the learning styles of teachers and student teachers. It includes learning strategies, motivation, and preferences for organizing information. Coffield and associates (2004) report that the ILS is "a rich model, validated for use in UK HE contexts, with potential for more general use in post-16 education where text-based learning is important. Reflective use of the ILS may help learners and teachers develop more productive approaches to learning." (p. 34-35).

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