

Designing Effective Projects: Thinking Skills Frameworks Learning Styles

Differences in Learning

Today's teacher knows that the ways in which students learn vary greatly. Individual students have particular strengths and weaknesses which can be built upon and enhanced through effective instruction. Project-based learning with technology is a powerful way to use students' strengths to help them become better thinkers and more independent learners.

Project tasks that allow students to use their individual learning styles are not a direct path to higher-order thinking, however. It is possible to create products that reflect shallow and superficial thought. (Ennis, 2000). Nevertheless, the motivating factors associated with choice when individual learning styles are addressed in projects, suggest that teaching thinking skills in the context of individual learning styles increases the likelihood that students will learn them.

The use of technology in projects also provides opportunities for students to make choices about how they learn, allowing them to take advantage of the strengths of their learning styles. Using software and hardware to create videos, slideshows, publications, and musical compositions can help students learn thinking skills and subject matter content in ways that acknowledge their talents and interests.

Visual-Auditory-Kinesthetic Learning Styles

The simplest and most common way of identifying different learning styles is based on the senses. Commonly called the VAK model, this framework describes learners as visual, auditory, or kinesthetic. Visual learners most effectively process visual information; auditory learners understand best through hearing; and kinesthetic/tactile learners learn through touch and movement. A study conducted by Specific Diagnostic Studies found that 29 percent of all students in elementary and secondary schools are visual learners, 34 percent learn through auditory means, and 37 percent learn best through kinesthetic/tactile modes (Miller, 2001).

VAK Learning Styles

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| Visual | Pictures, videos, graphics, diagrams, charts, models |
| Auditory | Lecture, recording, storytelling, music, verbalization, questioning |
| Kinesthetic | Acting, role-play, clay modeling |

Many online inventories and questionnaires are available to help people determine their preferred learning style. Although most are not scientifically reliable, they provide insight into learning preferences. Teachers must exercise caution, however, in relying on students' self-assessment of their learning styles. Researchers Barbe, Milone, and Swassing (cited in Cotton, 1998) argue that learners' preferences are not necessarily the area in which they are the strongest. In addition, all learning styles are not necessarily appropriate for all content. While it may be possible to learn something about driving a car by watching or hearing someone discuss it, few of us would want to be on the road with people who haven't had considerable hands-on learning experiences in an automobile. Choosing teaching methods based on sensory learning styles requires deep subject matter knowledge and good teacher judgment.

Left-Brain/Right Brain Learning Differences

Another method of categorizing individual learning styles is by brain hemispheres. Asselin and Mooney (cited in Miller, 2001) described learners as either right brain, global, or left brain, analytic. In general, global learners "perceive things as a whole, make broad general distinctions among concepts, are people oriented, and learn material in a social context" (p. 3). Analytic

learners, on the other hand, perceive things in parts rather than as whole and impose structure or restrictions on information and concepts” (Miller, 2001, p. 3).

How individuals concentrate on and remember new and difficult information is related to whether their cognitive processing style is global or analytic. Some students learn more easily when information is presented step-by-step in a sequential pattern that builds toward a conceptual understanding. Others learn more easily either when they understand the concept first and then concentrate on the details or when they are introduced to the information with a humorous story or anecdote related to their experience and replete with examples and graphics (Dunn, 1995, p. 18).

Brain Hemispheres

Left Brain: Analytical, logical, sequential, step-by-step, rational, part-to-whole
Right Brain: Holistic, random, intuitive, subjective, synthesizing

Personality and Learning Styles

During the 1990s, many teachers of older students became interested in another way of describing learning differences developed by Katherine C. Briggs and her daughter Isabel Briggs-Myers in 1942, and based on the psychological theories of Carl Jung. Called the Meyers-Briggs Type Inventory, this questionnaire has been used in business contexts as well as in education to determine individual personality types. The Inventory uses four pairs of terms and places the learner’s preferences on a spectrum between them: extravert and introvert (E, I), sensing and intuitive (S, N), thinking and feeling (T, F), and judgment and perception (J, P). The Myers-Briggs Type Inventory assigns individuals one of sixteen categories based on their inclination in each pair. For example, an INTJ (introvert, intuitive, thinking, judgment) is described as insightful, creative, rational, and independent. An ESFP, on the other hand, loves people and having fun, is practical and has common sense.

Myers-Briggs Type Inventory

Extravert: Get energy from being around people
Introvert: Get energy from being by themselves

Sensing: Want details, facts, rely on senses for information
Intuitive: Follow hunches, see patterns and the “big picture”

Thinking: Value fairness, objectivity, principles, and rationality
Feeling: Value harmony, emotions, and human needs

Judging: Like deadlines, planning, and are decisive
Perceiving: Are spontaneous, curious, and flexible

Although this inventory is widely used, care must be taken not to misuse the results. While useful information can be gleaned from the inventory, it can also be a source for dangerous stereotyping and labeling. Teachers who use the Myers-Briggs Type Inventory with adolescent students should use the results in the context of other information such as observation, interviews, and other learning styles tools.

Howard Gardner's Multiple Intelligences

In the last decade, more and more educators have warmed to Howard Gardner's theory of Multiple Intelligences. Logical/mathematical and linguistic intelligences, the two ways of thinking most valued in school are only two of eight intelligences described by Gardner based on biological and cultural research. In addition, he found spatial, musical, bodily/kinesthetic, interpersonal, intrapersonal, and naturalist intelligences.

Multiple Intelligences

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| Logical-Mathematical | The ability to detect patterns, reason deductively and think logically. This intelligence is most often associated with scientific and mathematical thinking. |
| Linguistic | Mastery of language. This intelligence includes the ability to effectively manipulate language to express oneself rhetorically or poetically. It also allows one to use language as a means to remember information. |
| Spatial | The ability to manipulate and create mental images in order to solve problems. This intelligence is not limited to visual domains. |
| Musical | The capability to recognize and compose musical pitches, tones, and rhythms. |
| Bodily-Kinesthetic | The ability to use one's mental abilities to coordinate one's own bodily movements. This intelligence challenges the popular belief that mental and physical activity are unrelated (ERIC, 1996, p. 2). |
| Interpersonal | A core capacity to notice distinctions among others; in particular contrasts in their moods, temperaments, motivations, and intentions (Gardner, 1993, p. 42). |
| Intrapersonal | Access to one's own feeling life, one's range of emotions, the capacity to effect discriminations among these emotions and eventually to label them and to draw upon them as a means of understanding and guiding one's own behavior (p. 44). |
| Naturalist | Expertise in the recognition and classification of plants and animals. These same skills of observing, collecting, and categorizing might also be applied in the "human" environment. (Campbell, 2003, p. 84). |

Learning Styles and Thinking Skills

A student who relies on hunches, feelings, and intuition to make decisions may have difficulty recognizing the value of a thinking process that prizes the careful analysis of assumptions and weighing of evidence. On the other hand, a student who is comfortable with linear thinking and the rational dissection of arguments, may find global, connected thinking extremely challenging. In any case, individuals can exhibit different learning and thinking styles in different contexts, and adding on a new credible way of processing information can only enhance a person's ability to make smart decisions in life. In order to help all students become the best thinkers they can be, may require not only expanding our ideas of what good thinking is, but also finding ways to persuade students of the value of using thinking strategies that may, at first, feel strange and uncomfortable.

In the Classroom: Learning Styles at Work
Elementary Concept: Simple Machines

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| VAK | Visual | Look for pictures of simple machines in newspapers or movies |
| | Auditory | Listen to and watch a construction worker explain how he or she uses simple machines at work |
| | Kinesthetic | Build a simple machine from clay |
| Left Brain/ Right Brain | Left Brain | Follow step-by-step directions to build a simple machine |
| | Right Brain | Discuss the role that machines play in our lives |
| Multiple Intelligences | Logical-Mathematical | Break complex machines down into simple machines |
| | Linguistic | Write a paper or make a speech describing the importance of a machine |
| | Spatial | Create a presentation showing the different ways in which a simple machine is used. |
| | Musical | Compose a song about a simple machine that uses the appropriate vocabulary. |
| | Bodily-Kinesthetic | Use everyday objects to create a simple machine |
| | Interpersonal | Work with a group to make a video about simple machines for pre-school children |
| | Intrapersonal | Keep a journal reflecting on how your learning about simple machines is progressing |
| | Naturalist | Find examples of simple machines in nature, such as birds' beaks as levers |

Secondary Concept: Interpretations of Allegories in Literature

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| VAK | Visual | Watch one of the <i>Lord of the Rings</i> movies and interpret it as an allegory |
| | Auditory | Listen to a sermon on parables or allegories from a religious perspective |
| | Kinesthetic | Make a video of an allegory |
| Personality Types | Introvert | Find an allegory that is especially meaningful to you and write a paper explaining its meaning. |
| | Extravert | Participate in a discussion of the allegory in <i>Lord of the Flies</i> |
| | Sensing | Compose an allegory based on something you have observed in your school |
| | Intuitive | Look at allegories from different cultures and identify patterns |
| | Thinking | Apply the components of an allegory to specifics of daily life |
| | Feeling | Write an allegory addressing an aspect of human experience that affects people's happiness |
| | Judging | Write a detailed project plan for developing an animated allegory |
| | Perceiving | Generate a list of possible projects related to allegories and select one to work on in more detail |

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| Multiple Intelligences | Logical-Mathematical | Interpret an allegory and discuss the consequences of its assumptions in a different context |
| | Linguistic | Write an original allegory |
| | Spatial | Make a model that represents an allegory |
| | Musical | Analyze the allegorical components of Don McLean's song, <i>American Pie</i> |
| | Bodily-Kinesthetic | Perform an allegory |
| | Interpersonal | Work with a group to produce a multimedia presentation about an allegory |
| | Intrapersonal | Apply the meaning of an allegory to your own life |
| | Naturalist | Write an allegory inspired by the behavior of animals in the wild |

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