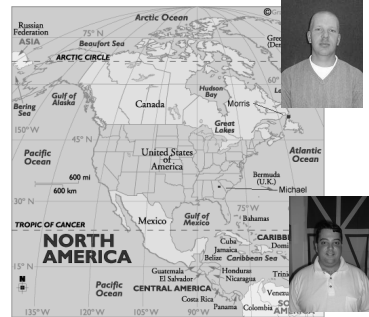


Learning Styles and Web-based Design for Secondary Students

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Presenters



Background

- Research was conducted with students enrolled in Enterprise Education 3205 through the Centre for Distance Learning and Innovation. (CDLI)
- Students completed the prescribed curriculum solely through e-Learning.
- 31 of the 44 students completed a learning styles inventory and agreed to the release of their marks.

Purpose of Research

- In the classroom, we are able to adapt our instructional approach, our methods, even our instructional material.
- This is much more challenging to accomplish in an e-learning environment.
- Do e-learning environments, such as the one created by the CDLI, lend themselves to one learning style over another?
- If they do, what can developers and moderators do to help learners achieve in the environment that they have created?

Research Profile

- Kolb and Baker Personal Learning Guide
- Standard learning styles measure (visual, auditory, tactile)
- Gardner's multiple intelligences

Personal Learning Guide

- The **Accommodative** Learning Style - learn best when allowed to gain 'hands on' experience
- The **Divergent** Learning Style - learn best when allowed to observe and gather a wide range of information
- The **Convergent** Learning Style - learn best when provided with practical applications of concepts and theories
- The **Assimilative** Learning Style - learn best when presented with sound logical theories to consider

Healey, M. and Jenkins, A. (2000). Learning cycles and learning styles: Kolb's experiential learning theory and its application in geography in higher education. *Journal of Geography*, 99, pp.185-195. Retrieved March 31st, 2004 from <http://www.chelt.ac.uk/gdn/discuss/kolb1.htm>

Personal Learning Guide

- Students rate sets of words on how well the words describe them.

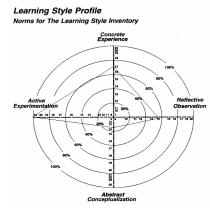
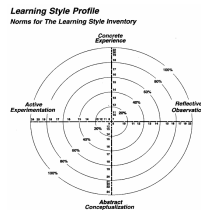
Discriminating Tentative Involved Practical

- 4 Best characterizes
- 3 Next best
- 2 Next best
- 1 Least characterizes

- Once the students have rated nine sets, they are asked to add their responses to certain sets together to give them four totals

Personal Learning Guide

- The four totals are plotted on the chart below to form a kite.



Personal Learning Guide

Number of students	Accommodator	Diverger	Converger	Assimilator
Highest number	52.8% (n=6)	58.8% (n=15)	69.8% (n=8)	85.0% (n=3)
Above 40%	53.5% (n=4)	57.8% (n=10)	77.7% (n=6)	85.0% (n=3)
Above 30%	52.8% (n=10)	60.6% (n=18)	69.5% (n=10)	65.5% (n=6)

Standard Measure

Visual Learners - you have to see it to believe it

Auditory Learner - if you hear it, you remember it

Tactual Learner - if you can touch it with your hands, you will remember it

Unknown, "Learning Lab - Learning Styles Evaluation," *University of Northwestern Ohio* (1998): 3 pages. 08 August 1999 <<http://bsd-server.nc.edu/virtcol/ss/learn.html>>.

Standard Measure

- Students were given a statement and asked to give it a rating

I remember information better from lectures with explanations and discussions.

I chew gum or snack when I study.

- 3 Often
- 2 Sometimes
- 1 Seldom

- After students had responded to 24 of these statements, they were asked to write the numbers they selected for each statement into three different columns and total each column.

Standard Measure

Number of students	Visual	Auditory	Tactile
Highest number	69.2% (n=13)	54.7% (n=9)	57.6% (n=13)
Above 20	71.3% (n=6)	45.0% (n=1)	65.7% (n=6)
Above 18	65.7% (n=15)	57.2% (n=9)	62.2% (n=16)

* Only one respondent

Gardner's Multiple Intelligences

- **Verbal/Linguistic intelligence** – refers to an individual's ability to understand and manipulate words and languages
- **Logical/Mathematical intelligence** – refers to an individual's ability to do things with data
- **Visual/Spatial intelligence** – refers to the ability to form and manipulate a mental model
- **Bodily-Kinesthetic intelligence** – refers to people who process information through the sensations they feel in their bodies
- **Musical-Rhythmic intelligence** – refers to the ability to understand, create, and interpret musical pitches, timbre, rhythm, and tones and the capability to compose music
- **Interpersonal intelligence** – is the ability to interpret and respond to the moods, emotions, motivations, and actions of others
- **Intrapersonal intelligence** – is the ability to know oneself

Giles, E., Pitre, S., & Womack, S. (2003). Multiple intelligences and learning styles. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*. Retrieved February 22, 2004 from <http://itstudio.coe.uga.edu/ebook/>

Gardner's Multiple Intelligences

- Students were given a statement and asked to state if it was true or false. If the statement was true sometimes and false sometimes, they were to leave it blank.

- If I am angry or happy, I usually know why. _____
- I pick up new dance steps quickly. _____

- After students had responded to 35 of these statements, they were asked to write an X over the numbers that they had responded "T" to based on the following table:

A	9	10	17	22	30	= _____
B	5	7	15	20	25	= _____
C	1	11	14	23	27	= _____
D	8	16	19	21	29	= _____
E	3	4	13	24	28	= _____
F	2	6	26	31	33	= _____
G	12	18	32	34	35	= _____

Gardner's Multiple Intelligences

	Inter-personal	Bodily-Kinesthetic	Intra-personal	Logical-Mathematics	Musical-Rhythmic	Verbal-Linguistic	Visual-Spatial
Highest Number	70.8% (n=4)	67.6% (n=9)	92.0% (n=1)*	66.7% (n=6)	53.3% (n=9)	58.7% (n=11)	65.7% (n=15)
Above 4	66.5% (n=12)	64.7% (n=11)	71.0% (n=2)	63.7% (n=15)	59.4% (n=14)	55.7% (n=15)	63.0% (n=18)

* Only one respondent

Trends and Patterns

- Students with the assimilative learning style tend to perform better than students from any of the other three learning styles.
- Students with the convergent learning style tend to perform better than students from the divergent and accommodative learning styles.

Trends and Patterns

- Students who are visual learners perform better than students who are tactile learners, who perform better than auditory learners.
- While there are few differences in student performance based upon Gardner's multiple intelligences, students who have aptitudes for "Musical-Rhythmic" and "Verbal-Linguistic" appear to be lower than the other five intelligences.

Trends and Patterns

- Data from an earlier, smaller, study with more a more select group of students provided somewhat different, but consistent results.
- The students who indicated strengths in the "Assimilative" and "Divergent" learning styles did well in the course. Three of the four that had the lowest marks in the class indicated a strength in the "Accommodative" learning style.
- It appears that the standard measure of learning style had no effects on the students' final marks, at least with this particular class.
- Of the nine students who had the highest mark, three indicated the "Logical-Mathematical" intelligence and four indicated the "Bodily-Kinesthetic" intelligences. Of the four students that had the lowest marks, two students indicated both the "Bodily-Kinesthetic" and "Musical-Rhythmic" intelligences. In addition, two of these students indicated the "Logical-Mathematical" intelligence, while two others indicated the "Verbal-Linguistic" intelligence.

Web-based Design

	Pages	w/Images	w/Tables	w/Interactivity	w/ Audio	w/ Video
Homepage	1					
Introduction	9	2	3			
Unit 1	76	9	2	7		4 (11)
Unit 2	63	4	2	6		1 (2)
Unit 3	80	17		3		1 (3)
Unit 4	62	9		4		2 (7)
Unit 5	72	16	6	4		6 (15)
Unit 6	31	2				1 (3)
Glossary	27					
Total	421	59		27		15 (41)

- number of pages with item (#) - number of total items

Considerations

- When teaching in an e-learning environment, instructors should provide more feedback to students, particularly those with the accommodative learning style.
- Instructors should also provide additional opportunities for students to interact in a verbal (e.g., audio or text -based) way.

Considerations

- Finally, instructors in an e-learning environment should consider allowing students to choose to complete more of their work in groups.
- In designing e-learning environments, developers should make sure to include more audio items (noting that audio portions of video clips may not be suitable for auditory learners).

Future Research

- Continue present course of research with additional students in future years (add additional intelligences to Gardner's scale).
- Consider having students complete the same course in different content shells that have learning tools suited to one learning style over another.

References

Giles, E., Pitre, S., & Womack, S. (2003). Multiple intelligences and learning styles. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*. Retrieved February 22, 2004 from <http://itstudio.coe.uga.edu/ebook>

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