Defining Individuals’ Learning Styles in a Technology-Enhanced Learning Environment

Silvia Wen-Yu Lee, Carl F. Berger, Neil Skov & Deborah Walker
NGI Visible Human Project
University of Michigan, Ann Arbor

http://vhp.med.umich.edu
Impact of technology to medical education

“If there is a single area that represents the greatest change in the way physicians are preparing to enter practice in the 21st century, it is the application of computer technology to almost every aspect of their education. -- Anderson & Brownell, 2000”
“…effective computer-assisted instruction can correct for many teacher’s inability to meet the needs of all learners.” -- Schelechter, 1991

“computer assisted instruction may not be the preferred mode of learning for all of the students” -- Ross, 1999
Previous Studies (1)

- Hoffman and Waters (1982) stated that CAI is suited best for individuals who “have the ability to quietly concentrate, are able to pay attention to details, have an affinity for memorizing facts, and can stay with a single track until completion.”

- Gregorc (1985) argued that sequential students prefer CAI because the computer is seen as an extension of the sequential person’s mind.
Previous Studies (2)

- Woods (1996) et al claimed that individuals who have a preference for CAI usually enjoy working alone.

- Ross & Schulz (1999) asserted that abstract-random (AR) learners may be at risk of doing poorly with certain forms of computer-aided instruction. They also argued that AR participants spent less time with program, used less video and made fewer interactions with the computer.
Objectives

- Understanding students’ learning styles in the context of actual learning experiences.
- Providing both qualitative and quantitative data to interpret the association between individual’s learning style and attributes of the learning environment.
Guiding Questions

- How students with different learning styles perceived and interacted with computer-based learning materials?
- What is the association between different learning styles and characteristics of the technology-enhanced learning environment?
Educational Setting

Available online materials:
- Review Items
- Anatomy Table
- Dissector (Lab Manual)
- Dissecting Movie
- Online Quizzes
- Clinical Cases

ATLASPlus
General:

- Skin
  - Epidermis
  - Dermis
- Subcutaneous tissue (superficial fascia)
- Investing and muscular fascia (deep fascia)
- Neurovascular bundle
- Origin, insertion and action of muscles

**Osteology:**

- Occipital bone
  - External occipital protuberance
  - Superior nuchal line
- Mastoid process
- Pectoral girdle
  - Clavicle
  - Spine and acromion process of scapula
# Anatomy Table

## Osteology of the Vertebral Column

<table>
<thead>
<tr>
<th>Bone</th>
<th>Structure</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>vertebra</td>
<td>one of a series of</td>
<td>a vertebra has two parts: the vertebral body and the vertebral arch; there are 33 vertebræ total: 7 cervical, 12 thoracic, 5 lumbar, 5 fused to form the sacrum, 4 coccygeal; features of a typical vertebra include: bodies, pedicles, transverse processes, laminae, articular processes, spinous process.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>irregular bones that</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>form the spine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vertebral body</td>
<td>the largest part of</td>
<td>it is shaped like a short cylinder; adjacent vertebral bodies articulate through a symphysis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the vertebra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vertebral arch</td>
<td>the ring of bone</td>
<td>the transverse processes and spinous process are attached to the neural arch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>formed by the paired</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Method (1)

Learning style survey

- focus on big picture vs focus on details
- prefer to follow procedure vs prefer to work at personal pace
- need hints and help for problem solving vs prefer to solve problems by myself
- prefer to learn verbally vs prefer to learn visually
- prefer to work alone vs prefer to work in group
Method (2)

- Student Interview
- Instructor Interview
Results (1)

Derived Stimulus Configuration

Euclidean distance model

Dimensions:
- Dimension 1
- Dimension 2

Points:
- hint-solvemyself (ave)
- follow procedure/pla
- forest-tree(ave)
- loner-group (ave)
- verbal-visual (ave)
Results (2)

Derived Stimulus Configuration

Euclidean distance model

Dimension 1

Dimension 2
Findings (1) Perception of Computer Use

**Terry**
- Situated-use of a computer
- Perceived *Anatomy Table* most useful
- Limited access to computer was a hurdle
- Computer problems were unbearable

**Jen**
- Thoroughly and systematically explored to all the materials
- Used *Anatomy Table* for review purposes
- Accommodated herself to the computer lab hours
- Persistent in trying computer applications
Findings (2): Learning Difficulties

Terry
- Reviewing information in multiple ways is confusing
- Linear Instruction

Jen
- Memorizing details
## Findings (3): Suggestions to Online Materials

<table>
<thead>
<tr>
<th>Terry</th>
<th>Jen</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ Would like to see the <em>relationship</em> among information</td>
<td>◆ Need more thorough materials for each lab</td>
</tr>
<tr>
<td>◆ Computer orientation</td>
<td>◆ Materials should be matching the content of each lab session</td>
</tr>
</tbody>
</table>
Discussion (1) Revisit Previous Research

Terry
- Learning at his own pace, paying attention to the big picture
- Using computer “by chance”
- Butler -- random learner

Jen
- Following procedure, focuses on details and hints for learning
- Integrating computer materials systematically into learning
- Gregorc -- sequential learner
- Kolb -- assimilator
Discussion (2): “One Size Fits All?"

- Students who focus on details of the learning materials may need more online information.
- Students who focus on the big picture may feel confused by the variation of information.
- Implementation of information organization.
Discussion(3): Beyond the Learning Style

Learning preference with computer can be inconsistent with one’s learning style.

What should be taken into account for future research: computer access, level of comfort with computer, and experience with technology.

The importance of computer orientation.
Conclusion

Implications for the Visible Human Learning Environment Design
Acknowledgement

- National Library of Medicine
  - Grant N01-LM-0-3511, PI: Dr. Brian Athey
- Division of Anatomical Sciences, University of Michigan, Ann Arbor
  - Dr. Burkel, Dr. Thomas Gest, Geri Pelok
Defining Individuals’ Learning Styles in a Technology-Enhanced Learning Environment

Silvia Wen-Yu Lee, Carl F. Berger, Neil Skov & Deborah Walker
NGI Visible Human Project
University of Michigan, Ann Arbor

The UM Visible Human Project http://vhp.med.umich.edu