



*"Aah, there's nothing more exciting than science. You get all the fun of sitting still, being quiet, writing down numbers, paying attention...yes, science has it all."*

*Principal Skinner*

## **Learning Theory Workbook** for the GILD Research Group

By Mary Sanseverino  
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On Wed, Jan 22<sup>nd</sup>, the first hour of the GILD meeting will be taken up with a tutorial on learning theories, methods and models. There is some "homework" you need to do to prepare for this tutorial. The prep is fun and won't take long at all. I calculate about 30 minutes of your time – you can take longer if you like. If you are totally pressed for time, please try item 2, the Learning Scenario. Most important – **even if you don't get any of this done**, don't let it stop you from coming to the talk.

Mary

### **Contents:**

- 1). Learning Styles Quiz:** 20 minutes
- 2). Learning Scenario:** 5 minutes
- 3). Learning Theories** – an overview table: (background information)
- 4). Learning Style Assessment Methods:** 5 minutes each – but you only need to do one.
  - The Block Problem
  - The Stick Problem
  - The Who Did It Problem
- 5). Bloom's Hierarchy and more:** (will do in tutorial)

## 1). Learning Style Quiz: 20 minutes

### INDEX OF LEARNING STYLES\*

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#### DIRECTIONS

Circle "a" or "b" to indicate your answer to every question. Please choose only one answer for each question.

If both "a" and "b" seem to apply to you, choose the one that applies more frequently.

1. I understand something better after I
  - (a) try it out.
  - (b) think it through.
2. I would rather be considered
  - (a) realistic.
  - (b) innovative.
3. When I think about what I did yesterday, I am most likely to get
  - (a) a picture.
  - (b) words.
4. I tend to
  - (a) understand details of a subject but may be fuzzy about its overall structure.
  - (b) understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
  - (a) talk about it.
  - (b) think about it.
6. If I were a teacher, I would rather teach a course
  - (a) that deals with facts and real life situations.
  - (b) that deals with ideas and theories.
7. I prefer to get new information in
  - (a) pictures, diagrams, graphs, or maps.
  - (b) written directions or verbal information.
8. Once I understand
  - (a) all the parts, I understand the whole thing.
  - (b) the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
  - (a) jump in and contribute ideas.
  - (b) sit back and listen.
10. I find it easier
  - (a) to learn facts.
  - (b) to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
  - (a) look over the pictures and charts carefully.
  - (b) focus on the written text.
12. When I solve math problems
  - (a) I usually work my way to the solutions one step at a time.
  - (b) I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
  - (a) I have usually gotten to know many of the students.
  - (b) I have rarely gotten to know many of the students.

14. In reading nonfiction, I prefer
  - (a) something that teaches me new facts or tells me how to do something.
  - (b) something that gives me new ideas to think about.
15. I like teachers
  - (a) who put a lot of diagrams on the board.
  - (b) who spend a lot of time explaining.
16. When I'm analysing a story or a novel
  - (a) I think of the incidents and try to put them together to figure out the themes.
  - (b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
17. When I start a homework problem, I am more likely to
  - (a) start working on the solution immediately.
  - (b) try to fully understand the problem first.
18. I prefer the idea of
  - (a) certainty.
  - (b) theory.
19. I remember best
  - (a) what I see.
  - (b) what I hear.
20. It is more important to me that an instructor
  - (a) lay out the material in clear sequential steps.
  - (b) give me an overall picture and relate the material to other subjects.
21. I prefer to study
  - (a) in a study group.
  - (b) alone.
22. I am more likely to be considered
  - (a) careful about the details of my work.
  - (b) creative about how to do my work.
23. When I get directions to a new place, I prefer
  - (a) a map.
  - (b) written instructions.
24. I learn
  - (a) at a fairly regular pace. If I study hard, I'll "get it."
  - (b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."
25. I would rather first
  - (a) try things out.
  - (b) think about how I'm going to do it.
26. When I am reading for enjoyment, I like writers to
  - (a) clearly say what they mean.
  - (b) say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
  - (a) the picture.
  - (b) what the instructor said about it.
28. When considering a body of information, I am more likely to
  - (a) focus on details and miss the big picture.
  - (b) try to understand the big picture before getting into the details.
29. I more easily remember
  - (a) something I have done.
  - (b) something I have thought a lot about.
30. When I have to perform a task, I prefer to
  - (a) master one way of doing it.
  - (b) come up with new ways of doing it.
31. When someone is showing me data, I prefer
  - (a) charts or graphs.
  - (b) text summarising the results.

32. When writing a paper, I am more likely to
  - (a) work on (think about or write) the beginning of the paper and progress forward.
  - (b) work on (think about or write) different parts of the paper and then order them.
33. When I have to work on a group project, I first want to
  - (a) have "group brainstorming" where everyone contributes ideas.
  - (b) brainstorm individually and then come together as a group to compare ideas.
34. I consider it higher praise to call someone
  - (a) sensible.
  - (b) imaginative.
35. When I meet people at a party, I am more likely to remember
  - (a) what they looked like.
  - (b) what they said about themselves.
36. When I am learning a new subject, I prefer to
  - (a) stay focused on that subject, learning as much about it as I can.
  - (b) try to make connections between that subject and related subjects.
37. I am more likely to be considered
  - (a) outgoing.
  - (b) reserved.
38. I prefer courses that emphasise
  - (a) concrete material (facts, data).
  - (b) abstract material (concepts, theories).
39. For entertainment, I would rather
  - (a) watch television.
  - (b) read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
  - (a) somewhat helpful to me.
  - (b) very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,
  - (a) appeals to me.
  - (b) does not appeal to me.
42. When I am doing long calculations,
  - (a) I tend to repeat all my steps and check my work carefully.
  - (b) I find checking my work tiresome and have to force myself to do it.
43. I tend to picture places I have been
  - (a) easily and fairly accurately.
  - (b) with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
  - (a) think of the steps in the solution process.
  - (b) think of possible consequences or applications of the solution in a wide range of areas.

# SCORING SHEET

- Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to Question 3, put a "1" in Column "a" by Question 3).
- Total the columns and write the totals in the indicated spaces.
- For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) with the larger total.

For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading (3 = 7- 4, and the "b" total was the larger of the two.)

ACT/REF			SEN/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1			2			3			4		
5			6			7			8		
9			10			11			12		
13			14			15			16		
17			18			19			20		
21			22			23			24		
25			26			27			28		
29			30			31			32		
33			34			35			36		
37			38			39			40		
41			42			43			44		
<b>Total (sum X's in each column)</b>											
ACT/REF			SEN/INT			VIS/VRB			SEQ/GLO		
	a	b		a	b		a	b		a	b
<b>(Larger - Smaller) + Letter of Larger (see below*)</b>											

\*Example: If you totalled 3 for a and 8 for b, you would enter 5b.

### Explanation of scores

- If your score on a scale is 1-3, you have a mild preference for one or the other dimension but you are essentially well balanced. (For example, a 3a in the ACT/REF category indicates a mild preference for active learning.)
- If your score on a scale is 5-7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favours that dimension.
- If your score on a scale is 9-11, you have a strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

**We shall discuss interpretation of these scores in the tutorial.**

#### ACTIVE AND REFLECTIVE LEARNERS (ACT/REF)

- Active learners tend to retain and understand information best by doing something active with it--discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.

#### SENSING AND INTUITIVE LEARNERS (SEN/INT)

- Sensing learners tend to like learning facts, intuitive learners often prefer discovering possibilities and relationships.

#### VISUAL AND VERBAL LEARNERS (VIS/VRB)

- Visual learners remember best what they see--pictures, diagrams, flow charts, time lines, films, and demonstrations. Verbal learners get more out of words--written and spoken explanations. Everyone learns more when information is presented both visually and verbally.

#### SEQUENTIAL AND GLOBAL LEARNERS (SEQ/GLO)

- Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."

**2). Learning Scenario**  
**(5 minutes)**

Imagine you are the senior teacher for CSC110. At the beginning of week 4 you are taking the students through the programming concept of repetition. The programming language is Java, and the students have had an intro to variables and assignments, primitive data types, control flow, the if statement, switch statement, and boolean expressions. They are aware of increment and decrement operators and conditional operators.

What are your top four student learning goals for this concept (repetition)? Why?

Don't go with deep thought at this juncture, top-of-mind is fine. Write your ideas down in the area provided below. Point form is fine. We will refine these ideas later. Remember to note why you think this goal is important. If you can only think of one or two, that is fine – just go with what you have.

<b>1<sup>st</sup> goal:</b>	<b>why?</b>
<b>2<sup>nd</sup> goal:</b>	<b>why?</b>
<b>3<sup>rd</sup> goal:</b>	<b>why?</b>
<b>4<sup>th</sup> goal:</b>	<b>why?</b>

### 3). Learning Theories – an overview table

DIMENSION	BEHAVIORAL	COGNITIVE	HUMANISTIC	SOCIAL COGNITION
<b>Primary Focus</b>	<ul style="list-style-type: none"> <li>• Observable behaviour</li> <li>• Stimulus-response connections</li> </ul>	<ul style="list-style-type: none"> <li>• Mental behaviour</li> <li>• Knowledge</li> <li>• Intelligence</li> <li>• Critical Thinking</li> </ul>	<ul style="list-style-type: none"> <li>• Affect/Values</li> <li>• Self-Concept/Self-Esteem</li> <li>• Needs</li> </ul>	<ul style="list-style-type: none"> <li>• Modelling</li> <li>• Vicarious Learning</li> <li>• Attitudes</li> <li>• Goals</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• Learning is a result of environmental forces</li> </ul>	<ul style="list-style-type: none"> <li>• Learning is a result of mental operations/processing</li> </ul>	<ul style="list-style-type: none"> <li>• Learning is a result of affect/emotion and goal-orientation</li> </ul>	<ul style="list-style-type: none"> <li>• Learning is a result of influences of social environment on thinking</li> </ul>
<b>Subcategories</b>	<ul style="list-style-type: none"> <li>• Contiguity</li> <li>• Respondent (Classical)</li> <li>• Operant (Instrumental)</li> </ul>	<ul style="list-style-type: none"> <li>• Information Processing</li> <li>• Hierarchical</li> <li>• Developmental</li> <li>• Critical Thinking</li> </ul>	<ul style="list-style-type: none"> <li>• Affect</li> <li>• Motivation/Needs</li> <li>• Self-concept</li> <li>• Self-esteem</li> </ul>	<ul style="list-style-type: none"> <li>• Observational (Social)</li> <li>• Self-efficacy</li> <li>• Goal-setting</li> <li>• Self-regulation</li> </ul>
<b>Major Theorists</b>	<ul style="list-style-type: none"> <li>• Thorndike</li> <li>• Pavlov</li> <li>• Watson</li> <li>• Skinner</li> </ul>	<ul style="list-style-type: none"> <li>• Dewey</li> <li>• Gagne</li> <li>• Ausubel</li> <li>• Bloom</li> <li>• Piaget</li> <li>• Bruner</li> <li>• Mayer</li> </ul>	<ul style="list-style-type: none"> <li>• Rogers</li> <li>• Combs</li> <li>• Purkey</li> <li>• Maslow</li> <li>• N.V. Peale</li> <li>• Ziglar</li> </ul>	<ul style="list-style-type: none"> <li>• Bandura</li> <li>• Sears</li> </ul>
<b>Principles</b>	<ul style="list-style-type: none"> <li>• Time/place pairings</li> <li>• Biological basis of behaviour</li> <li>• Consequences</li> <li>• Modelling</li> </ul>	<ul style="list-style-type: none"> <li>• Memory is limited</li> <li>• Changes in complexity</li> <li>• Changes over time</li> <li>• Good thinking requires standards</li> </ul>	<ul style="list-style-type: none"> <li>• Individual uniqueness</li> <li>• Self-determination</li> <li>• Dreams and goals are vital for success</li> </ul>	<ul style="list-style-type: none"> <li>• Reciprocal determinism</li> <li>• Individual responsibility</li> </ul>
<b>Methods</b>	<ul style="list-style-type: none"> <li>• Experimental methods</li> <li>• Laboratory studies</li> <li>• Systematic observation</li> </ul>	<ul style="list-style-type: none"> <li>• Experimental /correlational</li> <li>• Paper/pencil</li> </ul>	<ul style="list-style-type: none"> <li>• Clinical method</li> <li>• Paper/pencil</li> </ul>	<ul style="list-style-type: none"> <li>• Experimental /correlational</li> <li>• Systematic observation</li> <li>• Paper/pencil</li> </ul>

from Dr. W. Huitt, 1999: < <http://chiron.valdosta.edu/whuitt/COL/summary/lrndev.html> >

#### 4). Learning Style Assessment Methods: 5 minutes each – but you only need to do one.

One area of learning theory and method deals with looking at different learning styles – we looked at some learning styles in the first exercise in this workbook. Now let's look at our own learning styles when solving problems.

There are three problems presented below. Choose at least one to try. Don't worry if you don't get an answer quickly (or even at all), the point is to keep the following questions in mind as you try to solve the problem:

- What are you doing?
- Which strategies worked for you and which ones don't?
- What do you do when an approach doesn't work?
- Are you experiencing any feelings or emotions?
- Which problems would you rather avoid, or strongly dislike?
- Which do you feel confident about?
- Which problems were difficult/easy?

#### Problem 1: The Block Problem

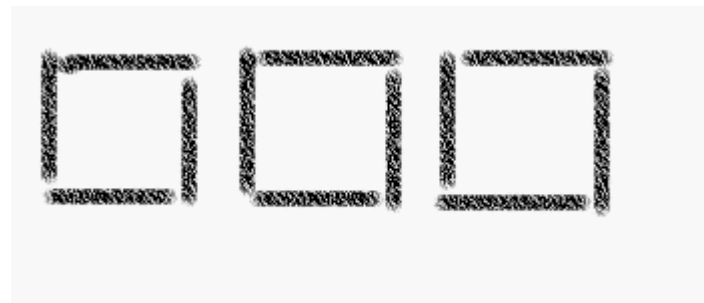
A painted wooden cube, such as a child's block, is cut into twenty seven equal pieces. First the saw takes two parallel and vertical cuts through the cube, dividing it into equal thirds; then it takes two additional vertical cuts at 90 degrees to the first ones, dividing the cube into equal ninths. Finally, it takes two parallel and horizontal cuts through the cube, dividing it into twenty seven cubes. How many of these small cubes are painted on three sides? On two sides? On one side? How many cubes are unpainted?

- Were you able to solve the problem?
- How did you do it?
- Were you successful on the first or second attempt?
- Did you use more than one strategy? (ie. Visualise and deduce that blocks have eight corners)

Write down a few words to help you remember how you solved this.

#### Problem 2: The Sticks Problem

Below is an image of twelve sticks are arranged so that they form three squares. Using all 12 sticks, rearrange them to make 10 squares. Is there more than one way to do this?



- Were you able to solve the problem?
- How did you do it?
- Were you successful on the first or second attempt?
- What strategy did you use?

Write down a few words to help you remember how you solved this.



### **Problem 3: The Who-Did-It Problem**

In this problem only one statement is true. Determine from the information given who did it?

- A said, "B did it."
- B said, "D did it."
- C said, "I did not do it."
- D said, "B lied when he said I did it."

- Were you able to solve the problem?
- How did you do it?
- Were you successful on the first or second attempt?
- What strategy did you use?

Write down a few words to help you remember how you solved this.

### **5). Bloom's Hierarchy and more: (will do in tutorial)**

This classification of levels of intellectual behaviour important in learning was completed by Bernard Bloom in 1956 and is commonly referred to as *Bloom's Taxonomy of the Cognitive Domain*. The full title was *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain* with the text having 4 other authors (M. Englehart, E. Furst, W. Hill, and D Krathwohl). Bloom found that over 95 % of the test questions students encounter require them to think only at the lowest possible level...the recall of information.

The major idea of the taxonomy is that what educators want students learn to can be arranged in a hierarchy from less to more complex. The taxonomy is presented on the next page. The taxonomy is presented with sample verbs and a sample behaviour statement for each level.

In the tutorial we will try to use this hierarchy to create some instructional objectives from the scenario in item 2 of this workbook. We will also attempt to match these with learning styles and develop some learning activities that speak to these styles. Because of time constraints, we will attack this problem in a "brainstorming" manner. If we are even able to complete one of these objective—learning style—learning activities triptychs, it will be enough.

More information on this subject can be found at < <http://chiron.valdosta.edu/whuitt/COL/summary/lrndev.html> > and at < <http://www.officeport.com/edu/blooms.htm> >.

**ADDING ON TO BLOOM'S TAXONOMY**

<b>LEVEL</b>	<b>DEFINITION</b>	<b>SAMPLE VERBS</b>	<b>SAMPLE BEHAVIOR</b>	<b>INSTRUCTIONAL OBJECTIVE FROM SENARIO</b>	<b>LEARNING STYLE</b>	<b>LEARNING ACTIVITY</b>
<b>KNOWLEDGE</b>	Student recalls or recognises information, ideas, and principles in the approximate form in which they were learned.	Write List Label Name State Define	The student will define the 6 levels of Bloom's taxonomy of the cognitive domain.			
<b>COMPREHENSION</b>	Student translates, comprehends, or interprets information based on prior learning.	Explain Summarise Paraphrase Describe Illustrate	The student will explain the purpose of Bloom's taxonomy of the cognitive domain			
<b>APPLICATION</b>	Student selects, transfers, and uses data and principles to complete a problem or task with a minimum of direction.	Use Compute Solve Demonstrate Apply Construct	The student will write an instructional objective for each level of Bloom's taxonomy.			
<b>ANALYSIS</b>	Student distinguishes, classifies, and relates the assumptions, hypotheses, evidence, or structure of a statement or question.	Analyse Categorise Compare Contrast Separate	The student will compare and contrast the cognitive and affective domains.			
<b>SYNTHESIS</b>	Student originates, integrates, and combines ideas into a product, plan or proposal that is new to him or her.	Create Design Hypothesise Invent Develop	The student will design a classification scheme for writing educational objectives that combines the cognitive, affective, and psychomotor domains.			
<b>EVALUATION</b>	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	Judge Recommend Critique Justify	The student will judge the effectiveness of writing objectives using Bloom's taxonomy.			

adapted from Dr. W. Huitt, 1999: < <http://chiron.valdosta.edu/whuitt/COL/summary/lrmdev.html> >