Climbing Bloom’s Taxonomy in Online Learning

By Robert “Bob” Bilyk

In support of online learning, we often write about climbing Bloom’s taxonomy with the help of learning objects created from templates. Bloom’s taxonomy refers to the work of Dr. Benjamin Bloom who wrote his *Taxonomy of Educational Objectives* in 1956. Since then the taxonomy has been widely used in curriculum and instructional design to classify the types of educational activities that require students to think. Those activities engage students in remembering, understanding, applying, analyzing, evaluating and creating. Instructors understand that a curriculum should not only engage students in recalling facts, but should involve students in understanding principles and concepts, applying their knowledge in novel situations, analyzing information with their new understanding, making critical choices and creating something. ‘Creating something’ requires knowledge of the facts, understanding of the concepts and, possibly, an analysis of a problem situation and judgment about what solutions might best apply. ‘Creating something’ is a synthesis of all these things and an observable outcome of what the student has learned.

Climbing Bloom’s taxonomy means helping students progress through the recall of information to higher orders of thinking such as understanding, applying, analyzing, etc. As online learning instructors, we look for opportunities to help students ‘climb the ladder’. In *Pathophysiology in Bloom: Implementing Bloom’s Taxonomy to Enhance Student Learning in Biology*, the authors provide a Blooming Biology Tool, a tool that lists the levels of Bloom’s Taxonomy. They also provide examples of a biology exam questions aligned to the taxonomy. What follows is a snippet of their work. Their table aligns to Bloom’s original levels of knowledge, comprehension, application, analysis, synthesis, evaluation. Since Bloom wrote his original taxonomy, a revision has been offered that labels the categories with student-centric action verbs rather than nouns, and places the act of creating at the top of the taxonomy. I have added labels in parentheses to show the alignment to the revised taxonomy.

**Knowledge (Remembering)**
Identify the parts of a eukaryotic cell; identify the correct definition of osmosis.

**Comprehension (Understanding)**
Describe nuclear transport to a lay person; provide an example of a cell signaling pathway.

**Application (Applying)**
Predict what happens to X if Y increases

**Analysis (Analyzing)**
Interpret data, graphs, or figures; make a diagnosis or analyze a case study; compare/contrast information.
Synthesis (Creating)
Develop a hypothesis, design an experiment, create a model.

Evaluation (Evaluating)
Critique an experimental design or a research proposal; appraise data in support of a hypothesis.

Instructors should analyze their courses in much the same way. They should understand what cognitive level each course element requires of the student from its objectives and content to its activities and assessments.

Biology in Bloom makes several critical points about the use of Bloom’s taxonomy in higher education.

“Most faculty would agree that academic success should be measured not just in terms of what students can remember, but what students are able to do with their knowledge. It is commonly accepted that memorization and recall are lower-order cognitive skills (LOCS) that require only a minimum level of understanding, whereas the application of knowledge and critical thinking are higher-order cognitive skills (HOCS) that require deep conceptual understanding (Zoller, 1993).”

A second critical point:

If classroom activities focus on concepts requiring higher order cognitive skills but faculty test only on factual recall, students quickly learn that they do not need to put forth the effort to learn the material at a high level. Similarly, if faculty primarily discuss facts and details in class but test at a higher cognitive level, students often perform poorly on examinations because they have not been given enough practice developing a deep conceptual understanding of the material. Either case of misalignment of teaching and testing leads to considerable frustration on the part of both instructor and student.

We see effective climbing of Bloom’s Taxonomy in some of the best materials produced by book publishers. Lippincott, for example, accompanies its nursing texts with multimedia lessons that present factual information and then require the students to apply the facts and understanding of concepts to case studies. One strategy that Lippincott uses is to move students through a case study where an emergency room patient presents a history of complaints that are ultimately related to the topic of study.

Instructors don’t always have access to publisher lessons in their field of study or license to use them. So that begs the question: can an instructor use learning objects to create what the publishers have created: presentation of information, followed by a case study in which students apply the information learned. More specifically can instructors use LodeStar Learning’s templates to help students climb Bloom’s taxonomy?

The answer is yes; however, we have the advantage of knowing precisely what each template can accomplish. Even our most seasoned authors are unlikely to know all of our
templates. To help with this challenge, we’ve created a table that suggests a template and an activity matched to each of the levels of Bloom’s taxonomy. Unfortunately, Bloom died just before LodeStar was born. If he were with us today, he would encourage us to continue working at it. Our next releases will increase the types of activities that students can complete in the higher levels of thinking. In the meantime, here is Bloom’s taxonomy aligned to LodeStar’s templates as they are at the time of this writing.

<table>
<thead>
<tr>
<th>Bloom’s Taxonomy</th>
<th>Description</th>
<th>Examples of Action Verbs</th>
<th>Tool</th>
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</thead>
<tbody>
<tr>
<td>Remembering</td>
<td>Students recall information such as facts, figures, and definitions. Students do not interpret or explain the relationships between facts. Examples: What is the distance from the earth to the sun?</td>
<td>Define Define Describe Describe Identify Identify Label Label</td>
<td>Brancher Description: Brancher presents information, asks questions, displays menus, and can branch students to a unique path based on their performance or how they answered a question. Brancher has different layout pages. Many of the pages are presentation pages that display text and images. The page layouts also include different question types such as multiple choice, matching, categorizing, and short answer. What follows are some examples of how you can use the various page layout types to help students recall information.</td>
</tr>
</tbody>
</table>

- **Presentation Pages**
  - Example: The following is a definition of Accrual Accounting.

- **Question Pages**
  - Example: Check off each of the moons that orbit Jupiter.
Challenger

Description: Challenger is a simple game. Instructors type in a word such as Photosynthesis. As students answer questions correctly, the ‘P’ appears and then the ‘h’, and so on. Students win if they answer enough questions correctly to spell out the word ‘Photosynthesis’. If they answer incorrectly, a letter explodes. Here is how to use Challenger to help students recall information.

- A simple game that asks questions. Students get immediate feedback in a fun way.
  - Example: Titan orbits around which planet?
    a) Earth
    b) Saturn
    c) Jupiter
    d) None
  - Example: In ________, companies record expenses in financial accounts when the cash is actually laid out
    a) Accrual
    b) Cash

Crossword

Description: Instructors make up their own hints (e.g. definitions) and the words that appear in the crossword.

Example:
The crossword is ‘accrual’.
The hint is: The ________ method allows the current cash inflows/outflows to be combined with
<table>
<thead>
<tr>
<th>Understanding</th>
<th>Students put information into their own words. Students describe the characteristics of a concept and are able to categorize information according to a concept. For example, students might be given a working definition of a planet and must then categorize Mercury, future expected cash inflows/outflows.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain</td>
<td>Describe Classify</td>
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</tbody>
</table>

Flashcards

Description: Flashcards can display questions. Missed items are returned to the card deck. Correctly answered questions are removed.

Flasher

Flasher displays questions. Missed items are returned to the queue at variable intervals. Correctly answered questions are removed.

FlowMaker, PresentationMaker, and LessonMaker

- HTML based templates that enable instructors to present information with html style text and graphics. No current support exists for instant feedback questions.

Brancher

- Matching Pages
  - Students drag a tile to a matching tile.
- Category Pages
  - Students drag a tile to the correct category column.

Flashcards

- Example: Identify the category that _______ belongs to.
  - Flashcards are displayed and students
<table>
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<tr>
<th>Applying</th>
<th>Students place concepts in situations that are different than the original presentation of the concept. Students might be given the rules for calculating compound interest. Now they are given</th>
<th>Solve</th>
<th>Interviewer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Illustrate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Calculate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earth and Titan as being planet or non-planet.</td>
<td>correctly categorize them by typing in a number or letter.</td>
<td></td>
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</tbody>
</table>

**Organizer**

- In Organizer, students order items according to a procedure (what should be done first) or to a logical order (most important to least important), geographic or spatial order, or according to a category.

- Example: Classify inferior planets as a 1, superior planets as a 2, and outer planets as 3.

Organizer can also be used for procedural questions.

- Example (titration procedure) Place the following in the correct order:

Prepare the solution.
Prepare your buret.
Take an initial volume reading.

Interviewer

- Interviewer simulates an interview that involves the student in making decisions. For example, the student may have been told about the advantages and disadvantages of a S-corporation versus a C-corporation. Now the student is introduced to a fictitious
| Analyzing | Students examine information, compare and contrast and draw conclusions. For example, students might have been given a checklist that helps them differentiate between a religious practice and a cult. In the analysis activity, student is given a scenario (a ritual practice) and must dissect the information for what is relevant and not relevant and then, from the relevant information, what conclusions can be drawn from the description of the ritual practice. | Compare Classify Contrast Infer | QuestMaker

QuestMaker is one of many templates that instructors can use to generate a WebQuest. A WebQuest introduces a topic, defines a task for students to complete, defines a process by which students will complete the task and then provides a set of links with supporting information that students can use to complete the task. WebQuests can be used to accomplish a variety of objectives. In terms of analysis, students can visit the websites and complete an project that shows evidence of their analysis. The paper can involve students in breaking down a case study and identifying relevant pieces of information through the new insights they received through the webquest links. Other templates that instructors can use to create WebQuests include the flash based WebQuest and Sequencer, as well as the html-based FlowMaker.

Important point: WebQuests can be used to generate activities that align to any level of Bloom’s taxonomy. The example module uses a WebQuest to engage students in creating a report. |

- Brancher or Splicer
  - Category Pages
    - Example: Students
read a passage and then drag items (taken from the passage) to either a column titled as irrelevant or to a column titled as relevant

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<thead>
<tr>
<th>Evaluating</th>
<th>Students make recommendations, make decisions, assess value and critique ideas</th>
<th>Assess, Compare, Decide, Discriminate, Measure</th>
<th>Brancher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Question or Menu Pages</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: students might be given a reading on one page and then asked to click on the statement that best reflects their evaluative judgment. After they commit their answer, the expert evaluation is revealed to them.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Creating</th>
<th>Students create solutions to problems or create a project that shows evidence of their knowledge, analysis, and evaluation ability. Creation is an excellent test of one’s mastery of the content. Students who understand aerobic or anaerobic respiration and the decomposition process at the atomic level might be able to design the perfect composter, for</th>
<th>Compose, Modify, Invent, Plan, Formulate</th>
<th>See WebQuests under Analyzing. The outcome of the WebQuest can be a project that students create. For example, the webquest might involve students in exploring websites that demonstrate best practice in performing a market analysis. The webquest project might be a market analysis.</th>
</tr>
</thead>
</table>
To conclude we offer an example of how each level of Bloom’s taxonomy translates to an activity. These are just snippets of learning objects to demonstrate as efficiently as possible the strategy being used to engage students at the targeted level.

http://www.engagelearner.org/lodestar/Blooms_Taxonomy/page.htm#0

References:
