Teaching Basic Sciences in DPT Program at Loma Linda University *

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One of the biggest challenges for educators is how to reach each student in the classroom. Every classroom has a mix of students who bring to the classroom good and bad study habits, different levels of comprehension and many levels of discipline and motivation. That is what makes every class period a challenge. If an educator does not take into consideration those factors then there will be a one-way type of education and not a true aim of education.

At Loma Linda University we have the privilege of using fresh cadavers every year to teach our students Gross Anatomy. We have discovered that it is the best method to help students learn and reinforce the importance of knowing all structures of the musculoskeletal system in a real human body. In addition our professor who teach the basic science courses such as Gross Anatomy are physical therapists with preparation in the basic sciences and current clinical experience in the field of physical therapy, thus, making the basics sciences more relevant to the field of physical therapy.

If as educators we want to have our students be thinkers we need to make sure we are reaching them in the different cognitive levels.

In 1956 a committee of educators chaired by Benjamin Bloom who also edited the first volume of the standard text, Taxonomy of educational objectives: the classification of educational goals. Although named after Bloom, the publication followed a series of conferences from 1949 to 1953, which were designed to improve communication between educators on the design of curricula and examinations. Bloom’s taxonomy is considered to be a foundational and essential element within the education community.

After much analysis, there was agreement that such a theoretical framework might best be obtained through a system of classifying the goals of the educational process since educational objectives provide the basis for building curricula and tests and represent the starting point for much of our educational research.

This theoretical framework refers to a classification of the different objectives that educators set for students (learning objectives). Trying to teach a class without learning objectives is like trying to buy an airline ticket without knowing the destination.

Bloom’s Taxonomy divides educational objectives into three “domains” Cognitive, Affective, and Psychomotor. Within the domains, learning at the higher levels is dependent on having attained prerequisite knowledge and skills at lower levels. A goal of Bloom’s Taxonomy is to motivate educators to focus on all three domains creating a more holistic form of education.

A revised version of the taxonomy was created in 2000.

The cognitive domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories, which are listed in order starting from the simplest behavior to the most complex. The categories can be thought of as degrees of difficulties. That is, the first ones must be mastered before the next ones can take place.

**Knowledge**: recall data or information

**Examples**: recite a policy. Quote prices from memory to a customer. Knows the safety rules.

**Key words**: define, describe, identify, know, label, list, match, name, outline, recall, recognize, reproduce, select, state.

LLU Gross Anatomy Class learning objective at the knowledge level: the student should be able to identify the bones of the body, ligaments, bursae, tendons, superficial and deep muscles of the back. Describe and diagram the anastomotic blood supply for the major articulations of the extremities.

**Comprehension**: Understand the meaning, translation, interpolation and interpretation of instructions and problems. State a problem in one’s own words.

**Examples**: Rewrites the principles of test writing. Explain in one’s own words the steps for performing a complex task. Translates an equation into a computer spreadsheet.

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** Physical Therapy, Loma Linda University
**Key Words:** associate, change, contrast, demonstrate, describe, distinguish, estimate, explain, infer, interpret, predict, rephrase, restate, summarize, translate.

LLU Gross Anatomy Class learning objective at the comprehension level: the student should be able to demonstrate knowledge of the functions of the perineal muscles.

**Application:** Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the work place.

**Examples:** Use a manual to calculate an employee’s vacation time. Apply laws of statistics to evaluate the reliability of a written test.

**Key Words:** apply, calculate, change, classify, demonstrate, discover, examine, generalize, modify, relate, prepare, show, solve, use.

LLU Gross Anatomy Class objective at the application level: the student should be able to demonstrate knowledge of the peripheral nervous system “roadways” including the brachial plexus, the lumbosacral plexus, their peripheral nerves, and the distribution of their terminal branches.

**Analysis:** Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.

**Examples:** Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training.

**Key Words:** analyze, arrange, compare, contrast, diagram, discriminate, distinguish, illustrate, relate, select, separate.

LLU Gross Anatomy Class learning objective at the analysis level: the student should be able to compare male and female sexual differentiation in development of reproductive tracts and external genitalia.

**Synthesis:** Builds a structure or pattern from diverse elements. Put parts together to from a whole, with emphasis on creating a new meaning or structure.

**Examples:** Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises a process to improve the outcome.

**Key Words:** Categorize, combine, compose, create, devise, design, explain, generate, modify, organize, plan, reconstruct, relate, revise, summarize, tell, write.

LLU Gross Anatomy Class learning objective at the synthesis level: the student should be able to relate the relationships of joint movement to the correct body plane.

**Evaluation:** Make judgments about the value of ideas or materials.

**Examples:** Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget.

**Key Words:** appraise, argue, assess, compare, conclude, contrast, convince, decide, explain, grade, judge, measure, rank recommend, select, test, validate.

LLU Gross Anatomy Class: this class does not have an evaluation or assessment component since it is a basic science class which serves as a foundation for more advanced courses in the curriculum.

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**Taxonomy of Learning Objectives from the Cognitive Domain (By Benjamin Bloom)**

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>PROCESS</th>
<th>TYPE OF PERFORMANCE</th>
<th>VERBS OFTEN USED IN DRAFTING SPECIFIC OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6th - EVALUATION</td>
<td>ABSTRACT</td>
<td>Be capable of making a critical judgment based on internal and external criteria.</td>
<td>Evaluate, Defend, Justify, Judge, Criticize</td>
</tr>
<tr>
<td>5th - SYNTHESIS</td>
<td></td>
<td>Be capable of accomplishing a personal task after devising a plan of action</td>
<td>Design, Support, Refute, Write, Schematize, Plan</td>
</tr>
<tr>
<td>4th - ANALYSIS</td>
<td></td>
<td>Be capable of identifying the elements, relationships, and organizational principles of a solution</td>
<td>Analyze, Deduce, Decide, Organize, Choose, Rank</td>
</tr>
<tr>
<td>3rd - APPLICATION</td>
<td></td>
<td>Be capable of remembering knowledge or principles in order to solve a problem</td>
<td>Solve, Classify, Calculate, State, Manipulate, Use, Apply, Modify, Put into practice</td>
</tr>
<tr>
<td>2nd - COMPREHENSION</td>
<td></td>
<td>Be capable of transposing, interpreting and extrapolating from a certain body of knowledge</td>
<td>Interpret, Explain, Differentiate, Describe, Demonstrate, Compare, Put in your own words</td>
</tr>
<tr>
<td>1st - KNOWLEDGE</td>
<td>CONCRETE</td>
<td>Be capable of recalling words, facts, dates, conventions, classifications, principles, theories, etc.</td>
<td>List, Recognize, Name, Identify, Define, Show, Recall</td>
</tr>
</tbody>
</table>