

## Title: Assessment of Concept Mapping as a Learning Method in a Human Anatomy Course

An expected student outcome of the physical therapy program is that “100% of graduates will successfully complete all Doctor of Physical Therapy course requirements and achieve entry-level competence on all criteria delineated in the Clinical Performance Instrument.” Concept maps have been used as a group presentation assignment in PTD 310- Human Anatomy for several years to assist students to learn anatomical concepts foundational to clinical practice e.g., anatomy of the knee joint or conditions with anatomical explanations e.g. numerical chromosome disorders. Anecdotally, I have noted that concept maps have improved student performance on course examination essay questions and students are positive about the concept map assignments. I hypothesize that the ability to appropriately and accurately represent and model a concept is affected by three learner abilities:

1. The ability to construct an accurate and complete list of terms to include in the concept map (term generation).
2. The ability to structure terms in a logical order that explains the concept (ordered map generation).
3. The ability to generate a “linking” phrase that accurately explains the relationship between ordered terms within a concept map (linking term generation).

It is hypothesized that student performance on one or more of these learner ability areas is positively related to each other and with student learning as measured on a course exam.

The research questions are:

1. *Does studying concept maps have a positive effect on essay question performance vs. study of standard course materials e.g., lecture notes, laboratory, textbook readings?*

H<sub>0</sub>- There is no difference in student performance on an essay question with use of a concept map vs. study of standard course materials.

H<sub>1</sub>- There is a positive difference in essay question performance on an essay question when using a concept map for study vs. study of standard course materials.

2. *Is there a correlation between student performance in a hypothesized learner ability area with other learner ability areas or course examination performance?*

H<sub>0</sub>- There is no correlation between student performance on concept map learner ability areas with each other nor with course examination performance.

H<sub>1</sub>- There is a positive correlation between student performance on a student learner ability areas with other learner ability areas and course examination performance.

A positive outcome on the research questions would support further development of concept maps as an evaluation and counseling tool to improve student performance in a human anatomy course.

### Experiment #1

#### *Method:*

Each student in the class will be provided with a study identification number. The class will be randomly assigned by study identification number to one of two groups: Concept Map study or Standard Course Material study. At the end of Week 2 (Thursday afternoon), the class will be given a concept map question and told that at the beginning of Monday lecture of Week 3 they will be asked to write an essay on this question. Earlier in the week, the students will have

received the same instruction on the question in lecture, laboratory and course readings. The concept map study group will be provided with an instructor generated concept map to study and instructed not to study any other course materials prior to Monday. The standard course material study group will be instructed to study only using the standard course materials and not to view or utilize the instructor- generated concept map.

On Monday, both groups will be asked to write a narrative response to the concept map question in a 15 minute time frame. At the conclusion of the test, the instructor generated concept map will be made available to all students. These essays will be graded by the course tutors using a grading rubric developed by the instructor. Graded essays will be reviewed by the course instructor for accuracy and consistency of scoring. The between group differences in scores will be analyzed by the Wilcoxon's rank sum test.

### Experiment #2

Three of the Week 3 concept map questions will be withheld from the group assignment. Instruction using standard course materials will be provided during that week. For each question, a paper form will be developed with the concept map question on the top of the page. Each concept map question form will have a different assignment:

1. Blank page with an instruction to generate the term list that answers the question.
2. A list of terms on the left hand column to be used to answer the question. The instruction is to correctly order the terms together on the page with a straight line between terms that explains the concept (an ordered map).
3. Students are provided with an ordered map of terms for the question. The instruction is to correctly develop linking phrases (1- 5 words) that explain the association between the ordered terms.

Each of the three questions and three assignments for each question will be randomly and equally assigned to a test pack and placed in random order. At the start of Week 4, students will be given three ten minute sessions in class to complete the three assignments in their test pack. At the conclusion of the experiment, all students will receive an instructor- generated concept map for each question to study for the examination.

The course tutors will grade the assignments using an instructor- generated grading rubric. Graded assignments will be reviewed by the instructor for accuracy and consistency of scoring. The distribution, median and quartile scores for each learner ability will be determined. The relationship between learner ability areas will be analyzed using the Kruskal- Wallace test. The relationship between learner ability areas and student performance on the Exam I written, practical and combined examination will be determined by the Spearman's rank order coefficient test.

### Timeline

May 2011- Identification of concept map assignments and complete grading rubrics.  
Sept. 2011- Training of tutors to grade assignments, administer Experiment #1 and #2.  
10/31/2011- Complete grading of Experiment #1 and #2 assignments.  
12/31/2011- Complete data analysis and report of Experiment #1 and #2.

Budget- \$1000 to fund course tutor stipends (\$100 per tutor; up to 10 tutors).