**Executive Summary**

The CLO show that there has been great success in some areas but in other areas there is room for improvement. The CLO feed into the GELO as required. The CLO demonstrate that learning certain areas of chemistry and biology present a considerable challenge to our students. Based on a careful and exhaustive analysis of the data a number of conclusions can be drawn. The students benefit from instruction that includes numerous everyday examples. The pure abstractions that are often used in science texts are too difficult for the student who is not a science or a math major. Also, assuming that the students understand all the words that are used at the college level is a mistake. The vocabulary of our students is often limited. It is important for the teachers in disciplines which use difficult terminology to take extra time and effort to explain the words that are used. Given the fact that we are constantly bombarded by visual imagery in popular culture the students appear to be becoming more and more visual learners. The students may therefore expect to see the concept more often in the form of a carefully designed illustration or animation. The improvements that have been implemented include providing greater access to the lecture material online; the incorporation of a greater amount of visual aids; and the reliance of everyday analogies to make difficult scientific concepts more understandable to the students with a basic lack of interest in science.

**Faculty Included in the Preparation and Sharing of this Report:**

Dr. Robert Droual

**Please provide a brief and cogent narrative in response to each of the following questions.**

1. Are the course learning outcomes (CLOs) on your spreadsheet accurate (as of right now), and do they represent the overall purpose(s) of the course(s)? *Please explain why or why not.*

Yes, they are accurate. The course involves acquiring a better understanding of the interactions of physical, chemical and biological processes occurring in the human body. Having an understanding of the basic chemical and biological principles that undergird anatomy and physiology is essential. The questions were designed to test the students understanding of some of these basic ideas.

1. Are the general education learning outcomes (GELOs) on your spreadsheet accurate (as of right now), and do they represent the overall purpose(s) of the program? *Please explain why or why not.*

Yes, they are accurate. Understanding how physical phenomena relate to the design and function of the human body is essential for a well-educated individual in our society. The CLOs contribute to this understanding.

1. How well do the course learning outcomes (CLOs) fulfill, support and align with the general education learning outcomes (GELOs)? Additionally, just in terms of the structure, do you think the assessment data from the CLOs can tell a qualitative *and* quantitative story about the GELOs? *Please explain, and take some time to think through and write about what kinds of GELO analysis your CLO assessments will foster.*

The CLO fulfill, support and align with the general education learning outcomes very well. The structure of the CLO contribute to a better understanding of how well the student is learning how acquiring a better understanding of scientific knowledge enables a better understanding of the human body. This information is not only beneficial for society in general but benefits the student by helping him/her become a better educated health care consumer.

The CLO will foster GELO analysis that relate directly to science education in our society. The United States is woefully poor in how well we prepare students to meet the scientific and technological challenges of the 21st century. With the amazing advances in biology and medicine that include stem cell research, investigation of the human genome, the application of computer science to improving our health care delivery systems, society would be ill served by an general education requirement that does not give the citizen a deeper understanding of how the body functions.

1. You’ve mapped your CLOs to GELOs. You’ve also been provided CLO assessment data in your packet. Now, take some time to reflect on, consider and analyze the data you have. This is not an easy section to complete, and the purpose of this pilot is to generate thoughtful reflection on—and assessment of—GELOs in relationship to our CLO assessment data.

Please look at every CLO data sheet included. Then, analyze, engage and write as much as you can, addressing the following question: ***what does your CLO data tell you about each of your GELOs?*** *Be detailed, descriptive and analytical.*

*As you consider this question…*

* + Discuss what kinds of trends you see in the data provided, and provide a qualitative assessment of each GELO.
  + Try to fill in the CLO data from each sheet on your spreadsheet, and attempt to come up with an aggregate percentage for your GELOs. Can you give a GELO quantitative assessment based only on your discipline/department courses?
  + **Please be thorough and provide as much reflection and analysis as possible. The more analysis, the better. Feel free to write beyond this page.**

The data shows the following:

The sample population for the class was 81 students.

On the first question:

Refer to Fig 1 Biomolecules, molecule C (the figure depicts cholesterol) represents a(n):

The correct answer of five possible answers was cholesterol. The incorrect foils included nucleotide, triglyceride, amino acid and monosaccharide. For this questions revealed that 75 of the 81 students correctly answered this question. Mathematical analysis reveals that this represents 92.6% of the students who answered this question answered it correctly. This finding relates to the GELO as follows: the students are successfully relating the basic structure of the cholesterol model to the role it plays in the interaction of chemical and biological processes.

The reasons for the success of this learning are hard to determine. One possibility is that the class consists predominantly of visual learners and they learned this particular molecule well. A possibility is that they may have had relatives that had high cholesterol and these relatives may have had cardiovascular diseases. Hence, there may have been an emotional connection between learning this misunderstood but important molecule and its medical importance.

The best way to use this valuable data is to apply it to teaching methods that enhance the use of visual aids in the classroom. If the students are indeed visual learners this will enhance the general education requirement as the students will be able to learn other subjects by the greater use of visual aids.

On the second question:

Ribosomes are tiny structures composed of:

The correct answer was “proteins and ribosomal RNA” incorrect answers included phospholipids and cholesterol, proteins and phospholipids and transfer RNA and ribosomal RNA.

For this question 71 of 81 percent of the students answered the question correctly. Mathematical analysis reveals that this represents 87.7 percent of the students who answered this question answered it correctly. This finding relates well to the general education requirement. General education requires that a student be able to read and comprehend what has been read. The fact that so many students were able to relate the word “Ribosomes” in the question to the adjective “ribosomal “ in the correct answers shows that they have a basic understanding of grammar and realize that changing the nominative form of a word to the adjectival form does not alter the essential meaning of the word. The fact they very few of the students chose the incorrect answer that included “cholesterol” further reveals their basic understanding of the role of the cholesterol molecule.

On the third question:

One of the properties that make water essential for life is its high:

The correct answer was “heat capacity”. The foils included “compressibility”, “tensile strength” and “all of the above”.

For this question 48 of 81 percent of the students answered the question correctly. Mathematical analysis reveals that this represents only 59.3 percent of the student who answered this question answered in correctly. This finding is disturbing and does not bode well as an indication of the student’s basic understanding of how science reveals an understanding of the body functions in this student population. However, there is a glimmer of hope in that the incorrect answer that was picked most often was “all of the above”. Apparently, the students have a basic understanding of the importance of water for life as well as its importance in their daily lives! The fact that they did not realize that fluid is incompressible and, because of the relative weakness of the hydrogen bonds holding the individual water molecules together, does not have “tensile strength” may be more of a reflection of their failure to have taken courses in chemistry and/or physics. The possibility that the students missed this question because of a general lack of common sense is too horrible for me to contemplate at this time.

On the fourth question:

The organelle that provides a transportation network for moving molecules around the cell is the:

The correct answer was “endoplasmic reticulum”. The incorrect answers included “Golgi apparatus”, “centriole” and “mitochondrion”.

For this question 66 of 81 students answered the question correctly. Mathematical analysis reveals that this represents 81.5 percent of the students who answered this question answered it correctly. This finding is very encouraging and relates well to the general education learning outcomes. The basic abilities undergirding all general education outcomes are an ability to read and comprehend as well as basic mathematical ability. If over 80 percent of the students in the class were able to read and understand the names of these very difficult to pronounce and spell words that are derived from Latin and Greek these students are indeed learning!

On the fifth question:

Vegetable oils are examples of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fats that have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonds between carbon atoms.

The correct answer was unsaturated fats and double bonds.

For this question 42 of 81 students answered the question correctly. Mathematical analysis reveals that this represents only 51.9 percent of the students who answered this question answered it correctly. The poor showing on this question is particularly distressing as general education should lead to a citizenry that has developed healthy life styles and eating habits.

1. *PRE-TRANSFER/BASIC SKILLS COURSEWORK.* Your discipline also includes pre-transfer and basic skills courses that are not part of the GELO matrix.

Please look at every CLO data sheet included for these courses. Then, analyze, engage and write as much as you can, addressing the following question: ***what does your CLO data tell you about each of your pre-transfer/basic skills courses?*** *Be detailed, descriptive and analytical.*

*As you consider this question…*

* + Discuss what kinds of trends you see in the data provided, and provide a qualitative assessment of your pre-transfer/basic skills courses.
  + **Please be thorough and provide as much reflection and analysis as possible. The more analysis, the better. Feel free to write beyond this page.**

As this is not a basic skills course this question does not apply.

1. **Action Plan.** Based on the assessments and analysis you have provided in questions 1-4, please consider what changes or improvements you would like to make, which might include updating your CLO or GELO statements, modifying course outlines, rethinking instruction efforts, using different assessment instruments, etc. ***Based on the analysis you have provided in questions 1-4, provide an action plan for improvement that draws on your assessment results and efforts.***

The students appeared to do well on the question that included a figure. This may be due to the fact that these students are visual learners. This suggests that including a greater number of figures in the lectures and discussions would increase the CLO and the GELO. Also, including more animations might help. The students live in a society where access to visual media is exploding. The students carry around smart phones that give them immediate access to the internet. I plan to try to incorporate more videos and interactive animations in future lectures and discussions.

1. The college should be making improvements based on student learning outcomes assessment, and we need to continue to document and share the improvements and progress you have already made. *This is extremely important.*
   * Did you make any changes in your CLO statements during the last 4-year cycle that ended in 2012, or any changes this year? *Please explain what you accomplished.*
   * Did you make any improvements in the areas of teaching and instruction processes, your courses, or your program? *Please explain and provide details about your efforts!*

I have decided that to include more online lecture material and to increase the number of figures and animations in my lectures. The students are easily bored and/or distracted. Using colorful figures with bright colors helps to wake them up when discussing chemistry and cell anatomy that does not have any sex and/or violence. Teaching these difficult topics at the college level is often not effective. Many of the words that are used in the college textbooks go way over many of our students’ heads. I attempt to provide explanations that uses as many simple words as possible and when it is necessary to use difficult words as often occurs in anatomy and physiology I take the time to explain the derivation of these words so that the meaning of the words becomes more accessible to the students.

As part of the online material that I provide to my students I have included links to useful videos. These videos now include Camtasia videos that I have made myself. Every lecture is presented in detail with explanations that include analogies that help the student to relate difficult concepts to their everyday lives. These videos also give the student a chance to pause the flow of information if they need to go to the bathroom or are having a difficult time understanding a particular concept. The videos also give the student an opportunity to replay difficult topics in the lectures. These videos have been well received by the students and should result in improved outcomes in the future.

1. Please reflect on the process of learning outcomes assessment in your division and at Modesto Junior College. What do you think would make it more meaningful? How could it be improved? What would help you?