Division of Academic Affairs

Bronx Community College

ASSESSMENT PLANNING

Department / Program: BIOLOGY and MLT
Department Chairperson: Dr. Martin Fein
Program Coordinator:
Academic Assessment / Review Leader: Seher Atamturktur
Date Submitted to the Academic Assessment & Review Committee (AARC): May 13, 2009

As Biology Department, we have been assessing General Biology I (Bio 11) and II (Bio 12), Human Anatomy and Physiology I (Bio 23) and II (Bio 24), and Microbiology (Bio28). The assessment of Microbiology and Infectious Diseases (Bio 28) is under development mainly because in our department so far the emphasis was on the assessment of on Bio 11/12 and 23/24 as core courses.

General Biology I (Bio 11) and II (Bio12)

1. What student learning outcomes will be assessed?

Identify the skills, knowledge, values or attitudes expected of students.

- Use the laboratory safely with consideration for others.
- Relate taxonomy to evolution.
- Use computers to simulate experimental procedures.
- Develop a simple hypothesis and grasp the procedural techniques used to run a protocol and acquire and analyze data from these techniques.
- Carry out experiments and generate graphs from the data acquired during experimental procedures and use the graphs to draw conclusions.
- Summarize functions such as cellular respiration, photosynthesis, cell division, protein synthesis and enzyme dynamics and understand the consequences of disturbing the balance that exists in thermodynamics.
- Analyze the relationship between structure and function and be able to associate the impact of disease and other stress that interferes with homeostasis.
- Students are expected to take responsibility for their own learning by coming to laboratory and lecture prepared and on time, seeking help when needed, reading the assigned materials, keeping track of changes in the syllabus, and making up missed material.

What program/course teaching goals do these outcomes fulfill?
In what courses will these outcomes be addressed?

- Use the laboratory safely with consideration for others—results in personal growth and maturity.
- Relate taxonomy to evolution—results in an understanding of scientific reasoning and analysis.
- Use computers to simulate experimental procedures—results in a better hold on information literacy.

- Develop a simple hypothesis and grasp the procedural techniques required to run a protocol—develops a better understanding of the scientific method.
- Carrying out experiments and generating graphs from data acquired during these experimental procedures and using the graphs to draw conclusions—develops a better understanding of the scientific method through mathematical analysis and develops critical thinking skills.
- Summarize functions such as cellular respiration, photosynthesis, cell division, protein synthesis and enzyme dynamics and understand the consequences of disturbing the balance that exists in thermodynamics—develops scientific reasoning and analysis, critical thinking skills and personal growth.
- Analyze the relationship between structure and function and be able to associate the impact of disease and other stress that interferes with homeostasis—develops scientific reasoning and analysis, critical thinking skills and personal growth.
- Students are expected to take responsibility for their own learning by coming to laboratory and lecture prepared and on time, seeking help when needed, reading the assigned materials, keeping track of changes in the syllabus, and making up missed material – results in personal growth and maturity

Identify any of these outcomes that speak to the College's General Education goals and proficiencies, and explain this relationship.
(See http://www.bcc.cuny.edu/banners/generaleducation/)

The outcomes address five of the General Education Goals:

Reasoning and Analysis must be used to:

1. Understand the consequences of disturbing the balance in thermodynamic relationships.
2. Understanding the evolutionary significance of taxonomy.
3. Generate data from experimental procedures.

Mathematical Methods—using graphs and data to draw conclusions.

Scientific Methods

1. Formulate a hypothesis and follow protocols to test the hypothesis.
2. Generate graphs from data acquired during experimental procedures and use the graphs to draw conclusions.

Information Literacy - Using computers to generate results from simulated experiments

Personal Growth and Professional Development

1. This is addressed in learning to use the lab safely.
2. Understanding the consequences of thermodynamic relationships, specifically the relationship between the burning of fossil fuel and photosynthesis.
3. Students are expected to take responsibility for their own learning.

2. What is the rationale for assessing them?

What problems or issues regarding student learning need to be addressed in your department, and why?

Please see Question #2 under Human Anatomy and Physiology I (Bio 23) and II (Bio24)

What curriculum components – including those in recently implemented new or revised courses –appear to be most challenging to students?

Please see Question #2 under Human Anatomy and Physiology I (Bio 23) and II (Bio24

Are there issues related to student learning or performance that have been raised by accrediting or other external evaluators? What are these issues?

Does not apply.

3. What methods will be used to evaluate student work?

What existing or new assessment instruments displaying student work will be used to measure student performance? (Some examples of instruments are assignments such as student projects, essays, reports, research papers, case studies, hypothetical situation responses; hard copy or E-portfolios; tests [possibly consider pre- and post- testing], minute papers, class exercises, oral presentations, or other in-class demonstrations of learned skills or acquired knowledge, etc.).

Existing Assessment Measurements:

- Results on exams and classroom discussions should reflect an understanding of evolutionary based nomenclature.
- Student lab reports must be completed and include materials and methods, results and conclusions.
- Student lab reports must include tables and graphs based on laboratory exercises and the conclusions drawn from results must be logical. Lab reports must reflect a respect for laboratory safety in the procedures section, and display an adherence to a defined protocol.
- Written exams and practicums will be used. In written exams students must demonstrate knowledge of the chemistry involved in cellular respiration and photosynthesis and the relation of each to the structure of the mitochondrion and the chloroplast, respectively.
- During practicums students must be able to identify the tissues, organs, and systems of the human body and be able to describe the function of these structural units.

New Assessment Measurements:

- In Biology 11 and Biology 12, we have implemented 25 common lecture final questions for the past 2 years (3 semesters). These questions cover the breadth and depth of topics in biology that are taught and discussed throughout the courses.
- In addition, we have begun implementing pre- and post-testing in both Bio 11 and Bio 12 laboratories with regard to Quantitative Literacy modules that we have added to our existing labs.

What criteria or measurement standards will be used to evaluate various levels of performance in student work? (This question relates to development of a rubric or other tool for identifying levels of student achievement of learning outcomes. Performance measurements should be identified for each learning outcome being assessed.)

Learning Outcome **What are students expected to do in order to demonstrate their competency**	**Performance Measurements**
Students will be able to use the computers to generate results from simulated experiments.	Lab reports must be completed and include materials and methods, results and conclusions.
Students will be able to use laboratory equipment efficiently and safely.	Student lab reports must reflect a respect for laboratory safety in the procedures section.
Students should be able to read and interpret laboratory protocols in a sequential manner.	Student lab reports must reflect an adherence to a defined protocol.
Students will be able to use laboratory exercises to deepen their understanding of cellular structure and function and the chemical nature of the cell.	Written exams and practicums will be used.
Students will be able to tabulate and graph results based on laboratory exercises; they will be able to draw conclusions relating structure to function from laboratory exercises.	Student lab reports must include tables and graphs based on laboratory exercises and the conclusions drawn from results must be logical.
Students will be able to use computers to generate results from simulated experiments.	Lab reports must be completed and include materials and methods, results and conclusions.
Students will understand the process of water absorption by angiosperms.	Students must be able to explain the process of water absorption by angiosperms in a written exam.

Students will demonstrate knowledge of the structural organization of the human body from tissues through organs and systems and the relation of these structural units to function.	During practicums and written exams students must be able to identify the tissues, organs, and systems of the human body and be able to describe the function of these structural units.
Students will appreciate the chemical nature of each of the systems in the human body.	Students must be able to define the chemical nature of each of the systems in the human body on exams.

Students will be able to define mitosis and meiosis, list their stages, and differentiate between the two processes.
Students will be able to identify and describe the major stages of animal development.
Students will be able to explain the steps of DNA replication, transcription, and translation and, using the genetic code, transcribe
Students will be able to identify the parts of flowers, fruits and seeds and state their functions and describe hormones and other factors affecting development.
Students will be able to state the basic laws of Mendel and apply these laws to solving problems using a Punnett Square. and translate a DNA
Students will be able to transform bacteria and do DNA fingerprinting.
Students will be able to identify the Domain, Kingdom, Phylum and lower taxonomic category of selected organisms and recognize adaptations used to maintain variation.
Students will be able to define evolution and identify the factors contributing to evolution
Students will be able to apply the Hardy-Weinberg equation to solve problems in population genetics.
Students will be able to distinguish between food chains, food webs, and food pyramids and describe the events in biogeochemical cycles.

How many students will be selected as the target population for assessment, and in which courses and sections?

Class	**Number of Sections/Total Sections**	**Total Number of Students (estimated)**
Bio 11	11 out of 15	300
Bio 12	5 out of 6	140

All sections will participate in pre- and post testing.

Which faculty will be involved?

Assessment Committee Leader: Seher Atamturktur

Bio 11 and 12 Assessment Group: Rebeca Araya, Chris Robinson, Laura Broughton, Howard Balter, Dexter Gibbs, Tahhan Jaradat, Kenneth Kruta, Charles Maliti, Harrinder Mater, Lorraine Rice

4. What is the timeline for assessment implementation?

For all courses we assess the timeline is as follows:

This semester Spring 2009

1. Program/course goals:

2. Learning outcomes

3. Assessment instruments: pre and post tests, QL modules, exams, lab reports.

4. Measurement criteria in rubrics or other assessment tools: example from QL based on graph interpretation.

Next and following semester Fall 2009/ Spring 2010

5. Collection of data

6. Analysis of data

Fall 2010

7. Sharing findings with department faculty

8. An action plan based upon findings

9. Reporting assessment findings and action plan

Human Anatomy and Physiology I (Bio 23) and II (Bio24)

1. What student learning outcomes will be assessed?

Identify the skills, knowledge, values or attitudes expected of students.

In Anatomy and Physiology I and II, we focus on the question "what student can do after completing the course guided by general education or basic skills". Our aim is to make sure that students develop competencies including over-arching skills, tools or ways of thinking and working that a BCC student should develop as a result of spending time in Anatomy and Physiology class.

In Bio 23, students are expected to demonstrate their knowledge of the topics covered by defining, listing, analyzing, and describing relevant information. Secondly, students are required to distinguish similar or related sets of information based on the acquired knowledge demonstrating their comprehension and analytical skills. Thirdly but not lastly, students are constantly led to extend and apply the basic knowledge for a greater and more active understanding of the topics explored. The introductory lectures in Bio 23 explores the human structure by defining and listing components such atoms, molecules, cells, tissues, in general providing a sense of structural hierarchy, and general chemistry. Then, the following lectures focus on some of the structures and systems, including bone, muscular, nervous, endocrine and skeletal systems.

Bio 24 provides students the information on how different systems work physiologically in human body and malfunctions/diseases related to these systems. Some of these systems include the circulatory system, respiratory system, urinary system, and reproductive system among others. This is building on to the concepts covered in Bio 23, so that at the end of these 2 courses, students would have covered the entire hierarchy of life from matter to organ systems and organism. By relating these concepts to common diseases of the various systems, students are more engaged in class and have a better connection to how knowledge garnered through Anatomy and Physiology will be relevant to their future allied health careers. We expect our students to demonstrate their knowledge of the topics covered by communication including reading, writing, listening, and critical thinking and information literacy including analysis, computation, research, problem solving.

To ensure that students are meeting our expectations, we regularly assess their understanding of the subject matter through surveys, quizzes, random questions in class, and end of semester common finals exams. In general, assessment is the process used to evaluate how well students have mastered the outcomes of a course, program or the college core competencies. Assessment of Bio 23 is used to examine how well students are prepared to master the content in Bio 24, and assessment of Bio 24 is used to examine how students developed competencies to carry over the information they gained to other courses or curricula.

What program/course teaching goals do these outcomes fulfill?
In what courses will these outcomes be addressed?

One of the major goals of Bio 23 and Bio 24 is to provide students with a broad survey of the structural components of the human body and to explore the rules of their physiological interaction, making the human life possible. From the learner's perspective, this would require mastery of a large body of information and the ability to integrate such information in a dynamic

fashion. Fulfillment of the mentioned outcomes will ensure that students complete the course with these projected goals. Therefore, we expect students to develop competencies in order to understand the topics via:

Communication

A. Read – Students will be able to comprehend and interpret various types of written information in documentation, such as graphs and figures.

B. Write – Students demonstrate the ability to:
• Communicate thoughts, ideas, information, and messages in writing
• Compose and create documents, such as: reports, memoranda, and graphs with correct grammar, spelling, punctuation, and appropriate language, style, and format

C. Listen—Students will be able to receive, attend to, interpret, and respond appropriately to (1) verbal and/or (2) nonverbal messages

D. Speak and/or Converse – Students have the ability to:
• Organize ideas and communicate verbal, or non-verbal messages appropriate to the audience and the situation
• Participate in conversations, discussions, and group activities
• Speak clearly and ask questions

Critical Thinking, Scientific Reasoning and Analysis, Mathematical Methods and Information Literacy skills.

These competencies are characterized by the ability to perform:

A. Analyze – including:
• Applying rules and principles to new situations or real life problems
• Discovering rules and applying them in the problem solving process by case studies
• Using logic to draw conclusions from information given
• Differentiating between facts, influences, assumptions, and conclusions

B. Compute – demonstrated by an ability to:
• Use basic numerical concepts, such as: whole numbers, percentages, estimates of math without a calculator
• Use tables, graphs, charts, and diagrams to explain concepts or ideas

C. Research – demonstrate abilities to:
• Collect Information
• Identify the need for data
• Obtain data from various sources
• Organize, process, and maintain records of the information collected
• Analyze the information for relevance and accuracy
• Synthesize, evaluate and communicate the results
• Determine which technology resources will produce the desired results
• Use current technology to acquire, organize, analyze, and communicate information

D. Solve Problems – Students demonstrate the ability to:
• Recognize whether a problem exists
• Identify components of the problem or issue

• Create a plan of action to resolve the issue
• Monitor, evaluate, and revise when necessary

Identify any of these outcomes that speak to the College's General Education goals and proficiencies, and explain this relationship.
(See http://www.bcc.cuny.edu/banners/generaleducation/)

An understanding of the human being from the biological perspective will contribute to understanding of our image within the social context. Society is shaped by the intellectual and behavioral pattern of its members. These in turn have anatomical and physiological basis that can arise from as small as molecular levels. Such awareness may be a significant factor in the way the members think and make decisions, that at large can shape the entire society.
Learning outcomes also address the academic, technological, and professional skills of the general education. In the academic area, these outcomes will ensure that students acquire the ability to manage both qualitative and quantitative information. The prerequisite for this process is certainly effective communication with the instructors and peers. Technologically, students are expected to engage in information search and also deepen their insight by utilizing resources such as Blackboard, computer generated animations, and various interactive media. As successful completion of the course is dependent on test-taking skills, attendance, participation, and efficient time management, students are exposed to the basic expectations of professionalism. Finally, the course addresses an important content area of the general education, the human structure and function. For example:

Scientific Methods: It will be used to formulate hypothesis and carry out the experiments in the labs.

Mathematical Methods: It will be used to calculate the results gathered from the experiments, and generate graphs.

Reasoning and Analysis: It will be used to evaluate and interpret the data gathered from the mathematical method and figures from the textbook.

Information Literacy: It will be used to promote students learning by having them research on topics using newspapers, internet, journals.

Personal Growth and Professional Development: It will be used to make students aware of the importance of learning about the human anatomy and physiology and diseases related to the topics.

2. What is the rationale for assessing them?

What problems or issues regarding student learning need to be addressed in your department, and why?

The goal of assessment is to provide feedback about how well the students are learning the content and whether the current pedagogical techniques are effective. When techniques are seen to be effective, they are implemented throughout all sections of the courses. In addition, content that is shown to be more difficult for students has more time devoted to it.

General Biology I (Bio 11) and II (Bio12), Human Anatomy and Physiology I (Bio 23) and II (Bio24), Microbiology (Bio28)

There are several specific problems that students taking biology often have:

- An inability to transfer knowledge from one class or academic topic to another
- Both weak quantitative reasoning skills and a lack of confidence in quantitative skills
- Weak critical thinking skills
- Difficulty with the specialized terms required in biology

The inability to transfer knowledge seems to be a wide-spread problem throughout the college. BCC's commitment to general education is one attempt to address it. In biology, we also have writing intensive courses, which emphasize putting concepts into words. In addition, this year with the help of a Perkins grant through the Center for Teaching Excellence, Biology 11 and 12 (and 23) are participating in a Quantitative Literacy Initiative to emphasize quantitative reasoning skills throughout the general biology courses. Over 15 of the sections are participating in a series of modules that focus on a number of skills required in data interpretation within biology. We are focusing on creating and interpreting graphs, in particular. We intend to make these modules standard in all sections with input from the faculty.

Logical and analytical reasoning is a major challenge for most students taking biology based on their consistently poor performance in application-based questions and it is important for us, educators, to constantly challenge our students to apply concepts covered to new situations. Such poor performance may be a result of lack of proper preparation at earlier stages in their education and it is our goal to try to address some of the deficits that the students come with, so that they leave us better prepared for their future. While it may be a tall order to address decade's long deficits within a semester, every effort should be made to try to reverse the situation with time. This is very critical as the careers that the Anatomy and Physiology students wish to pursue such as nursing, radiology, and other allied health programs require logical reasoning skills. One of the ways of achieving this goal may be to use analogies in class and to relate Anatomy and Physiology concepts to everyday life and to human diseases as much as possible. For example our recent Fall 08 common questions analysis showed that close to 70% of students struggled with application questions that asked students what would happen if the liver or kidneys were not functioning properly.

As for biological terminology – the specialized vocabulary in biology makes it almost like learning a second language. We have a medical terminology course in our department and we recommend taking it before taking Bio 23; however, it does not fit in most students' schedules and it does not cover all the vocabulary found in Bio 11 & 12.

In introductory courses information retention and critical thinking are two major problems that need to be addressed. It is likely that these are major challenges in many courses in the department. Information retention is dependent in large part on study skills, while critical thinking stems from logical ability and insight. While there will be variability in every student, both of these are areas that can be improved by training. It is extremely important that these issues be addressed for students to be able to appreciate the many essential and integrated topics of subjects such as Anatomy and Physiology. Without doubt, such appreciation would intimately be tied to successful completion of the course work. From a larger perspective, overcoming these challenges will directly reflect upon the teaching effectiveness of the entire department as many of our courses progress in sequence and build upon the knowledge from a previous course. To emphasize, improvements in information retention and critical thinking will contribute to the

general transferability of knowledge from one subject to another, and thus from one discipline to another.

The other problem is that students often take courses out of sequence. They perform poorly and have a low success rate when they take Bio 23, 24 or 28 without completing prerequisites. We also proved that students demonstrate better performances when they have a body of knowledge before they enter Bio 23. We run a pre-Bio 23 workshop in winter and summer 2006, 2007 and followed up the students who completed the workshop successfully. Their grades and success were significantly greater than those who did not have any science background.

As stated before, we also focus on the question "what can students do after completing the biology courses guided by general education or basic skills". Although one of our goals in Bio 24 is to have students develop competencies to carry over the information they gained to other courses or curricula, we still don't know whether students are capable of retaining and applying the information in other courses. Majority of the students in Bio 23/24 series are Allied Health students, and one of the ways to explore this concern is to collaborate with other departments and follow the students, or develop interdisciplinary activities. These activities may identify direct and indirect measures of learning outcomes. Outcomes are defined in terms of the knowledge (cognitive outcomes), attitudes (affective outcomes), and physical skills (kinesthetic outcomes) expected of students upon successful completion or upon transfer. These activities may also identify tracking information that demonstrates students' success and persistence in subsequent coursework at BCC, at transfer institutions, or in employment related to the program.

What curriculum components – including those in recently implemented new or revised courses –appear to be most challenging to students?

In General Biology, the most challenging topics are photosynthesis, cellular respiration, protein synthesis, and genetics. The chemical symbols and reactions and multiple steps involved in photosynthesis, cellular respiration and protein synthesis make them difficult for students to grasp. In General Biology II, the critical thinking skills, symbols, and many procedural steps required makes genetics difficult for students to understand and solve the problems.

If basic literacy skill can be considered as a curriculum component (curriculum being the pre-health path), it certainly appears to be a major challenge for many students in Bio 23. Lecture content and class discussions are based on the expectation that students can refer to the textbook without serious hindrance. However, this basic requirement is not met in many instances and the major focus of instruction must become shifted to alleviate reading comprehension. Reasons for this difficulty may include specialized nature of the subject matter, weak prerequisite for reading, and English being a second language for a number of students. A second challenge may be unfamiliarity with laboratory environment. A number of Bio 23 laboratory assignments require basic experimental skills and instrument use. Many students have had limited exposure or none to such environment previously. A solid foundation in this area is certainly a prerequisite to successful completion of the pre-health curriculum, or pre-bio 23 course.

One of the major challenging components in biology courses is to compute numbers, and generate or interpret graphs. For example, when students were recently asked how many amino acids are formed from a DNA component 150 nucleotides long, given that 3 nucleotides are used to make 1 amino acid, more than half of the students could not comprehend the question. To address this problem, this year with the help of a Perkins grant through the Center for Teaching Excellence, Biology 11 and 12, and 23 are participating in a Quantitative Literacy Initiative to

emphasize quantitative reasoning skills throughout the biology courses. Over 15 of the sections are participating in a series of modules that focus on a number of skills required in data interpretation within biology. We are focusing on creating and interpreting graphs, in particular. We intend to make these modules standard in all sections with input from the faculty, and we have been using basic numerical concepts, such as: whole numbers, percentages, estimates of math without a calculator and tables, graphs, charts, and diagrams to explain concepts or ideas.

Are there issues related to student learning or performance that have been raised by accrediting or other external evaluators? What are these issues?

Does not apply.

3. What methods will be used to evaluate student work?

What existing or new assessment instruments displaying student work will be used to measure student performance? (Some examples of instruments are assignments such as student projects, essays, reports, research papers, case studies, hypothetical situation responses; hard copy or E-portfolios; tests [possibly consider pre- and post- testing], minute papers, class exercises, oral presentations, or other in-class demonstrations of learned skills or acquired knowledge, etc.).

We developed an assessment process that gives us an exciting way to evaluate how well students are doing, enabling us to improve our teaching. The process, called **course-embedded assessment,** utilizes what we are already doing in the classroom. It has five simple steps, and all department faculty who are teaching Bio 23, Bio 24 are expected to participate.

Step One: As Anatomy and Physiology faculty we decided what competencies that we will assess each semester. These competencies address Critical Thinking, Scientific Reasoning and Analysis, Mathematical Methods and Information Literacy skills. Then, we decided what tool(s) will best demonstrate the students' learning outcomes involving these competencies. These tools are:

1. Common Final Exams (Existing measurement)
2. Pre and post tests (New measurement)
3. Quantitative Reasoning Activities/Modules (New measurement)

In Bio 23 & 24 lectures, student performance is measured by four in-class examinations, each given at the completion of prescribed topics. In addition one cumulative final examination is given at the end of the semester. The format of the exams includes in large part multiple choice questions that assess the general knowledge, understanding, application, critical thinking and analysis of the information and concepts covered. The final examination is cumulative and contains a set of common questions (33%) with emphasis on basic concepts. This allows for assessment of student performance at the entire course level which may include 15 sections. These basic instruments will continue to be used in evaluating student performance for all new teaching goals and learning outcomes that are identified. For the list of the concept emphasized in the exams, please refer to the fourth column of the attached matrices.

Similarly in the labs, direct assessment is made by weekly quizzes and two practical examinations involving use of models and microscope slides. A less direct assessment entails completion of

laboratory worksheets for each of the topics covered. The worksheets are designed to emphasize essential knowledge, guide through textbook reading, promote conceptual understanding, and promote application of the key elements in the relevant topics. General learning outcomes mentioned previously in response to the first question are addressed by the worksheets. While assessment method is dependent on instructional style, it may entail either verbal responses during in-class discussions or written responses to selected or all components of the worksheets. Specific learning outcomes assessed in the quizzes, practical examinations, and worksheets are listed in the attached matrices.

As we stated before, we aim to assess Bio 23 to see how well students retain the knowledge they gained in Bio 23 and transfer it to Bio 24. One way to investigate this issue to give students post test in Bio 23 at the end of the semester and use the same test as pre test in the first week of Bio 24 class. The results should show us what topics are challenging for students and needs to be focused on more in Bio 23. We also collaborate with Bio 28 faculty to implement a post test in Bio 24 to be used as pre test in Bio 28.

In addition, this year with the help of a Perkins grant through the Center for Teaching Excellence, Biology 11, 12 and 23 are participating in a Quantitative Literacy Initiative to emphasize quantitative reasoning skills throughout the general biology courses. Over 15 of the sections are participating in a series of modules that focus on a number of skills required in data interpretation within biology. We are focusing on creating and interpreting graphs, in particular. We will continue implementing these activities over the next two semesters. We intend to make these modules standard in all sections with input from the faculty.
Step Two: We also decided to develop a rubric or grading scale that articulates in words how we will grade the questions in common final exam and the quantitative reasoning activities. We are in the process of developing a common rubric to be used by all faculty implementing Quantitative Literacy modules, and common questions.We will identify groups of specific questions on common final exams that we address the competency.

Step Three: We have been using the common final exam questions for the past two semesters and continue using it. We will grade it using the rubric developed. We implemented the quantitative reasoning activities this semester for the first time and continue using it next semester, and assess the students' responses using a rubric.

Step Four: We will analyze the results of our assessment and record our data and share these data in our Bio 23 and Bio 24 course meetings.

Faculty members will discuss and share the following:

1. The common questions and quantitative reasoning assignments given.
2. The results, including the student needs and issues that the assignment revealed.
3. Based on the results, we will describe how we would change or improve the teaching of this assignment/topic. Were we satisfied? What do we need as instructors to improve our teaching and/or the student learning of the assignment?

Step Five: We will incorporate the needs discovered in step Four into Bio 23 and Bio 24 curriculum.

What criteria or measurement standards will be used to evaluate various levels of performance in student work? (This question relates to development of a rubric or other tool for identifying levels of student achievement of learning outcomes. Performance measurements should be identified for each learning outcome being assessed.)

In order to quantify student performance by the above methods, common exam questions and quantitative reasoning activities must be categorized based on the identified learning outcomes. Understanding the meaning of such result would require a standard that serves as a basis for comparison. We will develop our rubric based on some of the following criteria.

1. We will identify the questions on the test which we address the competency that we are assessing. We plan to have several questions throughout the exam that we require students to demonstrate mastery of the specific competency.

2. We will deepen our analysis of the questions by further categorizing them. A way to do this is offered in *Effective Grading,* by Walvoord and Anderson, page 87, created by Patricia Schlecht of Raymond Walters College in Ohio.

Level A: Those that require higher critical thinking, including analysis, synthesis or evaluation. For these questions, there may be no directly visible connection between the course material and the test question.

Level B: Those that require lower critical thinking skills, such as application. These questions can be directly answered from the background provided by course materials. There is a visible connection between the material and the test questions.

Level C: Those that utilize knowledge and comprehension, but not critical thinking. The answers to these questions arise directly from the course material, with some changes in wording and phrasing.

3. We will grade the entire exam using a Scant-ron, and then create a second key that only scores the answers to the questions that we have identified as addressing the proficiencies.

4. Then, we will analyze the results, looking at how many students missed what level of question. Based on the results we will address the following questions:

- Are we satisfied with how students performed?
- Is there anything we could do differently to try to ensure that more students answer the questions correctly?

5. We will discuss the assessment results and analysis in our department meeting and develop an action plan.

The results of the common examination may be interpreted as below:

Learning Outcomes*	Questions	Correct Responses (%)	Measurement Standard
Level A: Those that require higher critical thinking, including analysis, synthesis or evaluation. For these questions, there may be no directly visible connection between the course material and the test question.			Above 90: Excelled in this area or may require revision of the questions 70-90: Satisfactory performance Below 70: Not satisfactory and may require an action plan
Level B: Those that require lower critical thinking skills, such as application. These questions can be directly answered from the background provided by course materials. There is a visible connection between the material and the test questions.			
Level C: Those that utilize knowledge and comprehension, but not critical thinking. The answers to these questions arise directly from the course material, with some changes in wording and phrasing.			

It is possible that a particular question may serve to address more than one learning outcome. While a rubric such as above would make assessment at the level of common examination possible, a similar methodology could be employed by individual instructors to assess the learning outcome of the students and develop on-going action plans.

We also developed a rubric to asses' student learning outcome from quantitative literacy modules.

(It is still under development)

Question	Yes/No	Learning Outcome (see Bloom)
1. What are the variables shown in the x- and y- axes?		Comprehension
2. What units are used in the x- and y-axes?		Comprehension
3. What is the value of y for a given value of x?		Comprehension/Analysis
4. What would be an appropriate title for the graph?		Comprehension/Analysis
5. How would the shape of the graph change if we change the variable?		Comprehension/Analysis/Synthesis

How many students will be selected as the target population for assessment, and in which courses and sections?

Class	**Number of Sections/Total Sections**	**Total Number of Students (estimated)**
Bio 23	12 out of 15	290
Bio 24	8 out of 12	192

All sections will participate in pre- and post testing.

Which faculty will be involved?

Assessment Committee Leader: Seher Atamturktur

Bio 23 and 24 Assessment Group: Seher Atamturktur, Lee Kyang, Carlos Liachovitzky, Abass Abdullahi, Shylaja Akkaraju, Nichole McDaniel, Maureen Gannon, Alex Wolf, Rujin Tian

4. What is the timeline for assessment implementation?

For all courses we assess the timeline is as follows:

This semester Spring 2009

1. Program/course goals:

2. Learning outcomes

3. Assessment instruments: pre and post tests, QL modules, exams, lab reports.

4. Measurement criteria in rubrics or other assessment tools: example from QL based on graph interpretation.

Next and following semester Fall 2009/ Spring 2010

5. Collection of data

6. Analysis of data

Fall 2010

7. Sharing findings with department faculty

8. An action plan based upon findings

9. Reporting assessment findings and action plan

Microbiology (Bio28)

1. What student learning outcomes will be assessed?

Identify the skills, knowledge, values or attitudes expected of students.

At the completion of the course students should be able to:

- Discuss the differences between eukaryotic organisms as studied in BIO 23/24 to prokaryotic organisms.
- Compare and contrast the four major groups of infectious disease; bacteria, viruses, fungi parasites.

- Understand the role of the microbiology laboratory in growing and identifying infectious agents.
  - Use of the laboratory in a safe manner with consideration of others.
  - Carry out experiments and generate and interpret data
- Understanding the role of the nurse in properly collecting a clinical specimen for microbiological analysis.
- Development of laboratory skills for the diagnosis of infectious diseases; microscopy, cultivation, biochemical identification, assessment of antiseptics/disinfectants/antibiotics.

- Explain the importance of microorganisms involved in human disease.
- Correlating a patient's signs and symptoms with infectious diseases.
- Formulating an action plan for the treatment (antibiotics) and prevention (vaccination) of the various infectious agents discussed.
- Understanding the importance of infection control in the prevention and treatment of infectious agents.
- Understand the importance of microbial resistance to treatment and its impact it has on medical care.
- Identify microbial agents (bacteria, viruses, fungi, parasites) that are associated the various human body systems; respiratory, gastrointestinal, skin/wound…etc,
- Understand the control of microorganisms through; immunology (BIO 24), physical and chemical methods.
- Professionalism

What program/course teaching goals do these outcomes fulfill?
In what courses will these outcomes be addressed?

The major goal of BIO 28 is for pre-nursing/nursing students to have an overview of how infectious organisms are involved in producing disease and how these diseases can be treated or prevented. The students are expected to develop further their educational experience by:

Communicating with the instructor and with peers

A. Reading; comprehend written information as presented in the text and in the laboratory manual.
B. Write; laboratory reports and to answer short answer examination questions.

C. Listen; to verbal instructions as presented in lecture and laboratory.
D. Speak; convey their thoughts, comments, queries in a verbal manner.

Critical Thinking

A. Students should be able use information learned in support courses (BIO 23/24, CHM 02/17 and apply this information to BIO 28.
B. Students should be able to relate information learned in the course to various infectious diseases.
C. Students should be able to formulate an action plan for the treatment and prevention of infectious diseases.
D. Students should be to apply the information learned to answer examination questions.

Personal Growth/Development

A. Students will learn to develop skills in the analysis of laboratory information.
B. Students will learn to develop skills in the analysis of lecture information.
C. Students will learn to develop skills in developing learning objectives and key concepts for various units presented.
D. Students will learn to become independent learners.

Mathematical/Scientific Methods

A. The laboratory component of the course will address these issues.
    a. mathematical; laboratory calculations
    b. scientific; formulating a hypothesis and following protocols to test the hypothesis.

Information Literacy

A. Student assignments used to reinforce information presented in the lecture/laboratory.

Identify any of these outcomes that speak to the College's General Education goals and proficiencies, and explain this relationship.
(See http://www.bcc.cuny.edu/banners/generaleducation/)

The course contents will be integrated in a way to promote critical thinking, ability to apply scientific methodology for problem solving, which will enable them to work independently and become resourceful and engaged professionals.

2. What is the rationale for assessing them?

What problems or issues regarding student learning need to be addressed in your department, and why?

Please see Question #2 under Human Anatomy and Physiology I (Bio 23) and II (Bio24)

What curriculum components – including those in recently implemented new or revised courses –appear to be most challenging to students?

Please see Question #2 under Human Anatomy and Physiology I (Bio 23) and II (Bio24

Are there issues related to student learning or performance that have been raised by accrediting or other external evaluators? What are these issues?

Does not apply.

3. What methods will be used to evaluate student work?

What existing or new assessment instruments displaying student work will be used to measure student performance? (Some examples of instruments are assignments such as student projects, essays, reports, research papers, case studies, hypothetical situation responses; hard copy or E-portfolios; tests [possibly consider pre- and post- testing], minute papers, class exercises, oral presentations, or other in-class demonstrations of learned skills or acquired knowledge, etc.).

Teaching and learning Methods

Following criteria are used to deliver the course content across:

A- Lectures. The quantitative literacy is embedded in the course as we study microbial growth curves and analyze epidemiological graphs and charts. Information Literacy is incorporated in the form of micro assignments and reports
B- In class discussion to engage students and to help them strengthen communication skill both in Lecture and Laboratory sessions,
C- Laboratory Practical classes, Micro assignment and reports
D- Office hours (In the Study/Tutorial Lab)

Teaching and Learning Methods; Current Student Assessment Methods

The following methods are used to assess students learning outcomes;

- Didactic (lecture) 60% of the course grade
    - Three unit lecture exams consisting of multiple choice, matching and fill-in questions. Short answers may be also included in the testing format.
    - Lecture final exam which includes materials from the fourth unit and comprehensive questions testing the basic concepts of Microbiology and Infectious Control. The final exam because of the additional comprehensive questions should have a higher percentage value when determining the students grade. These four examinations assess knowledge/understanding outcomes, intellectual skills and general education proficiencies.
    - Quantitative literacy is embedded in the course; microbial growth curves and analyze epidemiological graphs/charts..
    - Discussion to engage students and develop communication skills.

- Psychomotor (laboratory) 40% of the course grade
    - Midterm laboratory practical examination

- Final laboratory practical examination
- Weekly/biweekly laboratory quizzes used to monitor and assess students understanding of the laboratory principles.
- Laboratory reports used to assess general skills and information literacy.
- Discussion and oral presentations to engage students and develop communication skills.

New Student Assessment Methods

- In Bio 28 the Final Lecture Exam is accumulative. We have decided to use 25 common questions as part of the accumulative final lecture exam. In these common final questions we intend to cover the main themes of the course content in a way that analytical/reasoning skills, quantitative and information literacy will be addressed as well.

- We will work with course coordinators for Bio 11/12, 23/24 to develop rubric to evaluate these common final questions. The evaluation of these common final lecture exam questions will be used to assess whether the students are exhibiting the intended learning outcomes and general skills.

- As a result of discussion with coordinators of Bio 23/24 it is decided that we will use a pretest for Bio 28 students in the beginning of the semester to assess their retention of the concepts/skills they learned in Bio 23/24 pre-request courses. This was being done informally by some faculty members but we will formalize it. This exam will consist of 15 – 20 basic concepts of Anatomy and Physiology with emphasis on Immunology.

What criteria or measurement standards will be used to evaluate various levels of performance in student work? (This question relates to development of a rubric or other tool for identifying levels of student achievement of learning outcomes. Performance measurements should be identified for each learning outcome being assessed.)

BIO 28 will use a format developed by BIO23/24. Twenty-five common exam questions will be embedded into the final lecture exam and will be categorized based on the identified learning outcomes of the course. Understanding the meaning of such result would require a standard that serves as a basis for comparison. A rubric will be developed based on the following criteria.

How many students will be selected as the target population for assessment, and in which courses and sections?

Class	**Number of Sections/Total Sections**	**Total Number of Students (estimated)**
Bio 28	5 out of 10	80

All sections will participate in pre- and post testing.

Which faculty will be involved?

Assessment Committee Leader: Seher Atamturktur

Bio 28 Assessment Group: Allan Gilman, Shazia Khan, Betsey Hallihan

4. What is the timeline for assessment implementation?

For all courses we assess the timeline is as follows:

This semester Spring 2009

1. Program/course goals:

2. Learning outcomes

3. Assessment instruments: pre and post tests, QL modules, exams, lab reports.

4. Measurement criteria in rubrics or other assessment tools: example from QL based on graph interpretation.

Next and following semester Fall 2009/ Spring 2010

5. Collection of data

6. Analysis of data

Fall 2010

7. Sharing findings with department faculty

8. An action plan based upon findings

9. Reporting assessment findings and action plan