Appendix A4.4.1

Biology
The Department of Biological Sciences Response to Governor Rick Scott’s Questions

A Coordinated Response Document to Governor Scott’s Queries Associated with Educational Program and Work Force Preparedness.

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A) What studies has your university done in the last three years to ensure your graduates are meeting the needs of employers.

1) We have currently aligned the Biology curriculum in Science Teacher Education with the standards set forth by the Florida Department of Education (FDOE) and NCATE to ensure that graduates are prepared to teach and qualify for licensing and certification. (Appendix A) Intrinsic in the educational training is to prepare students in the practical aspects of teaching through a mandatory 12 hours+ of supervised and evaluated teacher internships in local schools. Among our science education majors that have graduated in the past five years; 100% were able to secure teaching employment within Florida schools and within one year of graduating the Florida A&M department of biological sciences’ program.

2) We have measured the number of our graduate program students who have achieved post graduate employment and retained employment based on employment satisfaction and or graduating students who have successfully entered into professional schools:

Graduate Students who received MS from Biology Department in the past six years and who are now successfully employed:

1 Rebecca Buggs-Teaching K-12
2 Charmaine Thompson- Biotechnology Industry
3 Uyen Lee- Teaching K-12
4 Aja Lampley- Teaching K-12
5 Zekiya Ross- Biotechnology Industry
6 Augustine Nkembo-Teaching Assistant
7 Camille Webster-Teaching Assistant
8 Rashieri Snalls- Biotechnology Industry
9 William McClaine- Biotechnology Industry
10 Cynthia Jones- Teaching Assistant
11 Victor Badejogbin- Biotechnology Industry
12 Errol Wilson- Educational Consultant
13 David Bauer- Teaching Assistant
14 Ronald St-Preux- Industry
15 Charlotte Grant- Industry
16 Mimi-Teaching
17 Ryan Hale- Industry

Graduate Students with MS from FAMU Biology who are now in Medical/Dental School or PhD programs

1 Michael Ruden-PhD
2 Augustine Nkembo-PhD
3 Camille Webster-PhD
4 Taj Shelton-Med
5 Cynthia Jones -PhD
6 Jermaine White-White
7 David Bauer-PhD
8 Mimi-Medical School
9. Sheila Fil-Aime-PhD
10. Brittni Jones -Medical School
Percentage of MS graduates in the last six years who are currently working and/or going to school
80.9% (17/21)
Percentage of MS graduates in the last six years who are currently in PhD and/or Medical degree program; 48% (10/21).
Percentage of MS graduates in the last six years who are currently in Medical Degree program; 9.5% 2/21

1. Provide pertinent information that may include the involvement of advisory boards in your programs, the composition of the advisory boards to include employers and industry representatives in the profession.

   We do not have specific “advisory boards” internally as such but we have an equivalent program review process which includes internal and external program reviewers. Further, we have regular site visits from the FDOE and NCATE external evaluation boards which assess the quality an impact of our science education program as a whole including the certification process required for teaching employment. The Southern Association of Colleges (SACS) accreditation process also ensures we produce students from an accredited institute which is of note to most employers. The accreditation process itself ensures each student receives quantitatively and qualitatively adequate content preparation to meet the needs of employers. We regularly have members of industry consult with our advisement staff on what types of students with what skills they are currently seeking.

2. Employer surveys and alumni surveys conducted in the past three years.

   The College of Education maintains a wealth of post-graduate alumni/employer survey data on our science education graduates as well as all college of education graduates.

   We also survey our students via interviews and email contact through our advisement staff and keep FTCE teacher’s certification data. From this monitoring we can confidently state that 100% of our science education students pass their FTCE and 100% have been hired within one year and are still retained by their employers over a range of 1-3 years.

   Medical School Programs where our students have been accepted have repeatedly come back yearly to recruit more students from the Florida A&M Department of Biological Sciences and have cited to our advisement staff in person their satisfaction with the previous students they recruited from our program.

   Industry members such as Proctor and Gamble; Eli Lilly; Heinz inc., and Merck Pharmaceuticals all regularly recruit students from our biological sciences program. Their repeated visits for recruitment provide a strong suggestion of satisfaction with former recruited students from the department of biological sciences at Florida A&M University.

3. Accreditation standards that deal specifically with competencies required in professional practice.

   With regard to teaching and readiness for employment our standards and competencies are routinely evaluated by the FDOE and NCATE governing bodies which require that all biology science education students meet specific Florida standards and competency skills for K-12 teaching (Appendix A). Certification of achievement of these governed competencies is via the Florida State Teachers Certification Examination or FTCE examination. Additionally every ten years the Southern
Association of Colleges and Schools reviews all programs and pay more attention to specific areas regarding employment training via the accreditation process. The Southern Association of Colleges and Schools (SACS) board measures these achievements via Institutional Program Direct and Indirect measures whose outcomes are evaluated and used for improving effectiveness of the current methods employed to achieve these goals. Further internally we conduct a “Program Review” of our educational competencies as well as our program goals and achievements of which are included those goals related to student post-graduate success. These are measured via an interview based post-graduate survey.
B. Do you have measurable goals to meet employers’ current needs? If so, please provide them. How often are these goals updated?

Our “employers” are largely other universities and educational programs since our Biology students (STEM discipline) will go on typically to continuing education endeavors in health related areas (Medical or Dental School) and Graduate school. Hence our general employers’ “current needs” are mostly associated with providing students who are knowledgeable in general biology including cell, molecular and organismal biology topics, genetics, microbiology, cell biology, anatomy and physiology, vertebrate physiology, immunology, ecology, and developmental biology as assessed through course comprehensive final examinations, standardized exams such as the ETS generated major field test in biology, medical college admissions test, dental school admissions test and GRE Subject Test. Goals for these assessment instruments are contained within our Academic Learning Compacts at the IP Institutional Program level; see below. Also (Appendices B-E)

1. List pertinent goals/learning outcomes to meet needs of employers from accreditation standards:

Based on SACS supporting documents such as our Academic Learning Compact Criteria we have several learning outcomes each associated with goals or measured outcomes and each directly related to an employer’s needs. These are presented below for each expected area of possible post graduate employment:

*The data concerning the measured achievement of the below listed outcomes and goals is attached as appendix B-G.

Educational Institutes seeking graduate and medical/dental students:

The following Student Learning Outcomes address the needs of institutes seeking students for their Masters, PhD and Medical degree programs. Some Goals are also listed. Goals that are the most relevant to the area presented are shown.

- Graduates will be able to demonstrate specific content knowledge, concepts, principles, and theories of biological sciences.

(Post-BS programs need knowledgeable students)

- **Direct Goals**
  Final Exam score analysis for the five General Biology courses assessed will show that at least 70% of the students will receive a score of 60% or better on these cumulative content specific final exams. Each semester students taking the MFT will obtain scores of at least 45 or better on average in each of the four assessed subject areas on the Biology MFT this corresponds generally to a score ~16% below the National Means in these areas.

- **Indirect Goals**
  Responding to the survey of student perception of the efficacy of their training in Biological Science content areas, 70% of the students will indicate that their knowledge in each of the core areas has "greatly improved" relative to their knowledge in these areas upon entry into the program. Responding to an Exit Interview, 80% of the graduating students will indicate that their training in each curriculum course has empowered them to proceed with confidence and success towards their next educational or career aim (i.e. Graduate school, Medical School, Education).
• Students will demonstrate communication skills which include - reading, speaking, writing, questioning, listening, and making presentations about issues related to life sciences.

(Medical Schools Graduate Schools need students who have superior communication skills. Students must often communicate; written-reports, exam answers, responses to in-class queries, presentations, essays, analyses of case studies. Students who meet the criteria of this outcome will be well suited for such communication tasks)

• Students also will be able to use technology and primary literature resources efficiently and effectively to conduct and present research.

(Technology is frequently used in Medical Schools for example in presenting virtual lab materials on Anatomy and Physiology. Students well versed in technology skills will have better success in these environments)

• Graduates will be able to demonstrate the ability to use critical and creative thinking in designing and conducting experiments, analyzing and evaluating results, in the synthesis of solutions and relevant discussion in and in solving problems in the biological sciences.

(Success in Graduate School requires analytical capabilities. Medical schools have also changed their programs from ones of pure rote memorization to programs that emphasize analytical skills)

• **Direct Goals**
  
  75% of students completing a concept mapping exercise in Immunology PCB4233 will score 8.0/14 or better on the exercise. 50% of the Students completing a capstone project in Genetics known as the "Drosophila crossing experiment" will correctly identify the hereditary basis for the inheritance of 2 distinct traits carried in Drosophila fruit flies. 70% of these students will receive rubric scores of 3.0/5.0 or better on average as it relates to their "thought process" that led them to their conclusions. 50% of students in the BSC1011 (two sections) Biology II course will correctly identify and illustrate the phylogenetic relationships amongst their data sets. 60% will score 3.8/5.0 or better when evaluated by a GEAC CT rubric for Synthesis and Evaluation skills. 50% of Biology students taking the MFT will score a 48 or better on the analytical skills section of the MFT. 50% of Biology students taking the MAPP will score 112 or better on the analytical skills section of the MAPP test.

• **Indirect Goals**
  
  All of the program outcomes will be assessed by an exit interview and an exit survey. Students completing 45 hours will also be given a survey regarding their perception of the Department. Responding to the survey, 70% of the students will indicate that they are being well prepared to assess problems using the analytical reasoning skillfully.

• Students will demonstrate the ability to successfully work **collaboratively** and independently in a variety of academic settings.

(The scope of certain projects is far to great for independent solitary achievement and mandates collaborative actions. Students trained in this area and meeting the outcome objectives will be better suited to handle such projects successfully)
Graduates will be able to demonstrate biological laboratory and field skills.

(The Students in post-bac programs will invariably be involved in laboratory research and will require advanced laboratory skills to be competitive.

**K-12 Educational institutes seeking Teaching employees:**

- All graduates will receive a degree from our University, which has an accredited program.
  
  (Teaching employment requires this at most institutes)
  
- Graduates will be able to demonstrate specific content knowledge, concepts, principles, and theories of biological sciences.
  
  (Teaching the K-12 content requires above all teachers have a thorough knowledge and understanding of the academic content along with the ability to apply that knowledge to a variety of educational context) (See FDOE and NCATE required content Matrices… Appendix A).

**Direct Goals**

- GPA analysis for the Biological Sciences Teacher Education core curriculum courses will show that 100% of graduating students majoring in the multiple curricula within the department of Biological Sciences Teacher Education will successfully complete their core curriculum classes with a “C” or better, with an expectation that they will have a 70% average on a variety of assessments covering multiple topics in the field of biology. • 100% of Biological Sciences Student taken the Biology FTCE will pass the exam • 70% of the senior Biological Science Teacher Education Majors will score 50% or better on the Biological Sciences Field Test (BSFT) given during the conclusion of their last senior semester.

**Indirect Goals**

- Responding to the survey of student perception of the efficacy of their training in Biological Science content areas, 70% of the students will indicate that their knowledge in each of the core areas has "greatly improved" relative to their knowledge in these areas upon entry into the program. • Responding to an Exit Interview, 80% of the graduating students will indicate that their training in each curriculum course has empowered them to proceed with confidence and success towards their next educational or career aim (i.e. Graduate school, Medical School, Education), Education).
• Students will demonstrate communication skills, which include: reading, speaking, writing, questioning, listening, and making presentations about issues related to life sciences.

  (Teachers who can communicate effectively make good teachers. A good teacher must communicate knowledge to their students in written, visual graphic and oral form almost continuously. The creation of examinations and teaching outlines necessitates superior communication skills)

• Students also will be able to use technology and primary literature resources efficiently and effectively to conduct and present research.

  (The use of technology in teaching pedagogy exist globally in most educational institutes, graduating students with superior ability to use technology will adjust to using technology in teaching with few complications.

• Graduates will be able to demonstrate the ability to use critical and creative thinking in designing and conducting experiments, analyzing and evaluating results, in the synthesis of solutions and relevant discussion in and in solving problems in the biological sciences.

  (Successful teaching includes teaching students analysis skills. Students who have been trained in this area will have a better understanding of how to train others in the critical thinking process)

• Students will demonstrate the ability to successfully work collaboratively and independently in a variety of academic settings.

  (The scope of certain projects is far too great for independent solitary achievement and mandates collaborative actions. Students trained in this area and meeting the outcome objectives will be better suited to handle such projects successfully)

• Graduates will be able to demonstrate biological laboratory and field skills.

  (Most teaching positions in the K-12 sciences have associated student lab requirements. Students successfully trained in laboratory skills will be better enabled as employed teachers to execute the creation and implementation of their own K-12 student lab programs.)

• NCATE Standards and Outcomes specifically related to educating and internships:

  o Students will demonstrate the ability proficiency in the competencies listed below. (Goals include the 100% success at passing the FTCE which directly assesses knowledge of these competencies (See appendix A for the exact alignment of these standards and competencies with the currently offered FAMU department of biological sciences curriculum.)

  o L1.1 Define Biology and list the seven properties of life.
  o L1.2 List in order from molecular to biosphere level the correct hierarchal progression for biological organization.
L1.3 Define emergent properties and discuss this concept in relationship to the transition between different levels in the hierarchal progression of biological organization.

L1.4 List and differentiate the three major Domains of life and the four eukaryotic kingdoms.

L1.5 Compare the current theory of evolution by natural selection with previous scientific theories of evolution.

L1.6 List the actions employed in the scientific method.

L1.7 Differentiate between assumptions, inferences, observations, hypotheses, conclusions, theories and laws.

L2.1 Define chemistry and distinguish between the various states of matter

L2.2 Differentiate between pure substances (elements, compounds), homogeneous mixtures, and heterogeneous mixtures.

L2.3 Differentiate between physical and chemical properties and physical and chemical changes of matter.

L2.4 Identify types or examples of bonds (e.g., metallic, ionic, polar covalent, nonpolar covalent).

L2.5 Relate electronegativity differences to bond type.

L2.6 Using the periodic table, determine the number of protons, neutrons, and electrons in an atom or ion of a specific isotope.

L2.7 Using the periodic table, analyze periodic trends in physical properties (e.g., ionic size, atomic size, boiling point, melting point) of the representative elements.

L2.8 Using the periodic table, determine electron configurations and orbital filling diagrams for elements with atomic numbers 1–56 and their ions.

L2.9 Relate an element's chemical reactivity to its valence-shell electron configuration.

L2.10 Discuss the relationship of valence shell electron pair repulsion (VSEPR) theory to molecular shape.

L2.11 Discuss and cite an example of how molecular shape relates to biological function.

L3.1 Discuss the process of polymer formation versus polymer disassembly in terms of condensation and hydrolytic reactions.

L3.2 Identify the biological functions of each macromolecular biochemical.

L3.3 Differentiate between the chemical structures of common biochemical compounds (e.g., lipids, amino acids, peptides, sugars, carbohydrates, nucleic acids).

L3.4 Identify major characteristics of strong and weak acids or bases.

L3.5 Evaluate the characteristics of buffer systems.

L4.1 Identify properties of simple organic compounds.

L4.2 Identify proper names and formulas for simple organic compounds containing one functional group.

L4.3 Identify common functional groups in an organic molecule.

L5.1 Discuss the relationship between the structures and functions of cell membrane components.

L5.2 Compare active and passive cellular transport mechanisms.

L5.3 Evaluate the relationships between the structures and functions of cell membrane components.

L5.4 Compare anabolism to catabolism generally and in terms of energy.

L5.5 Analyze the relationship between organisms (e.g., producers, consumers, decomposers) and their trophic levels.

L5.6 Identify substrates, products, and relationships in aerobic respiration (e.g., glycolysis, the Krebs cycle, electron transport), including metabolism of carbohydrates, fats, and amino acids, and in anaerobic respiration (e.g., alcoholic fermentation, lactic acid fermentation).

L5.7 Compare end products and energy yields of anaerobic and aerobic respiration.

L5.8 Analyze the role of chemiosmosis in photosynthesis and respiration.

L5.9 Compare photosynthesis and their products of C3 photosynthesis, as well as factors that affect the rate of light-dependent reactions and the Calvin cycle.

L5.10 Identify key differences between C3, C4, and CAM photosynthesis, and the evolutionary and ecological significance of these pathways.

L5.11 Evaluate the roles of cell recognition (e.g., cell-to-cell signaling, autoimmune diseases, tissue rejection, cancer, pollen or stigma-style interaction) in normal and abnormal cell activity.

L5.12 Identify cell-to-cell communication (e.g., electrical, chemical) in living things.

L5.13 Differentiate the events of each phase of the cell cycle (e.g., G1, S, G2, M) and the regulatory mechanisms of the cycle.
Industry Employers Seeking Science Research Personnel - Biology Curriculum

- Graduates will be able to demonstrate specific content knowledge, concepts, principles, and theories of biological sciences.

  (Employers expect knowledgeable students in the specified scientific fields. Employees who are lacking in knowledge make mistakes some of which may be financially ruinous to our industry partners who employ our graduates. Hence employers actively pursue employees with superior knowledge skills such as those trained through FAMU Biology).

Students will demonstrate communication skills; which include reading, speaking, writing, questioning, listening, and making presentations about issues related to life sciences.

  (Employers want students who can communicate effectively. Company projects, reports and presentations are routine and graduating students with effective communication skills will be able to execute these actions with precision and little guidance)

Students also will be able to use technology and primary literature resources efficiently and effectively to conduct and present research.

  (Undeniably technology is broadly used in the work place students who have these skills are more likely to be hired and retained. Almost all science journals are now ePublished, hence a knowledge of how to use technology to obtain these documents is essential for employees who must depend on the latest research findings of others to advance their own research endeavors for their employees)
Graduates will be able to demonstrate the ability to use critical and creative thinking in designing and conducting experiments, analyzing and evaluating results, in the synthesis of solutions and relevant discussion in and in solving problems in the biological sciences.

(Graduating students who enter industry will often find themselves in charge of independent research projects. There is an expectation that the new employee can conduct the experiments and analyze the results independently. It is crucial that students have adequate exposure to the analytical reasoning process to be prepared for such job tasks.)

Students will demonstrate the ability to successfully work collaboratively and independently in a variety of academic settings.

(The scope of certain industry projects may be far too great for independent solitary achievement and mandates collaborative actions. Students trained in this area and meeting the outcome objectives will be better suited to handle such projects successfully)

Graduates will be able to demonstrate biological laboratory and field skills.

(Most industry positions in the areas of biotechnology will rely heavily on laboratory skills. Research technicians and associates will use these skills to conduct real-world cutting edge experiments)

- **Direct Goals**
  60% of students will score a 65% or greater on their written and practical lab skills mastery test (BSC1011L) during its first administration. Each student must retake the test until a score of 100% is earned prior to graduation (BSC1011L).
- **Indirect Goals**
  All of the students graduating with a B.S. in Biology will have a minimum 2.0 in all Biology Lab classes. All of the program outcomes will be assessed by an exit interview and an exit survey. Students completing the program will be given a survey regarding their perception of the department. Responding to the survey, 70% will respond positively that their experience in the department has enhanced their ability to work in a laboratory competently.

2. List pertinent goals/learning outcomes to meet needs of employers from advisory board input.

**K-12 Educational institutes seeking teaching employees**
The Florida Department of Education is the lead advisory board along with NCATE and requires students pass their FTCE which is a requirement to get employed as a teacher within the state of Florida. Also these agencies set-forth and mandate specific alignments of our curriculum to K-12 competencies and standards. (Appendix A)
C. Do you have measurable goals for each graduate in the areas of writing proficiency and critical thinking? If so, please send them to me with the goals and include the results for the last five to ten years.

The results for the outcomes and goals listed below for the past 5-10 years are also included as Appendices (B-F)

1. List specific measurable goals in your program relating to writing proficiency and critical thinking.

**Communication Skills:**

**Outcome:**
- Students will demonstrate communication skills which include - reading, speaking, writing, questioning, listening, and making presentations about issues related to life sciences.

- **Direct Goals**
  78% of our students taking BSC1011 Lecture-General Biology II will get rubric scores of 3.0/5.0 on average on their written essay question on their 3rd examination. 80% of our students will achieve a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I 6 page written report in its post-assessment evaluation. 75% of Students in PCB3063 Genetics will score a 3.0/5.0 rubric score on a written capstone scientific paper assignment when assessed for writing skills. 70% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) will receive grades of 75% (3.75/5.0 rubric score) or better. 60% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) will receive grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

- **Indirect Goals**
  75% of sophomores responding to a survey regarding their perception of how the biological sciences program has improved their ability to communicate in written and spoken form will indicate that their core curriculum courses greatly improved their ability to write and present publicly. Responding to an exit interview and survey concerning students perception of how well their biology education has prepared them to communicate outside of the college environment, 80% of the graduating students will indicate that their training has been beneficial for preparing them for global communication.

**Results:**

**2010**

- **Direct Measures**
  - **Fall 2010**

  73.6 % of our students taking BSC1011 Lecture-General Biology II received rubric scores of 3.0/5.0 on a written essay question presented on their 3rd examination. 60.4 % of students achieved a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. 76.2 % of Students in PCB3063 Genetics scored a 3.0/5.0 rubric score on a written capstone scientific paper
assignment (the polytene lab assignment) when assessed for writing skills. 58.2% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) received grades of 75% (3.75/5.0 rubric score) or better. 61.7% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

Spring 2011  
71.5% of our students taking BSC1011 Lecture-General Biology II Sections 1-3 Spring 2010 received rubric scores of 3.0/5.0 on a written essay question presented on their 2nd and 3rd examinations 44% of students achieved at least a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. 68.3% of Students in PCB3063 Genetics scored at least a 3.0/5.0 rubric score on a written capstone scientific paper assignment (the polytene lab assignment) when assessed for writing skills. 100% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) Pro-seminar received grades of 75% (3.75/5.0 rubric score) or better. 72% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

• **Indirect measures**
• **Fall 2010**

67.5% of sophomores responding to a survey regarding their perception of how the biological sciences program has improved their ability to communicate in written and spoken form indicated that their core curriculum courses greatly improved their ability to write and present publicly.

Spring 2011  
Survey evaluation data has not been completed

2009

• **Direct Measures**
• **Fall 2010**

71.2% of our students taking BSC1011 Lecture-General Biology II received rubric scores of 3.0/5.0 on a written essay question presented on their 3rd examination 61.2% of students achieved a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. 72.6% of Students in PCB3063 Genetics scored a 3.0/5.0 rubric score on a written capstone scientific paper assignment (polytene lab assignment) when assessed for writing skills. 60.2% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) received grades of 75% (3.75/5.0 rubric score) or better. 52.4% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.
• **Spring 2010**

66.8% of our students taking BSC1011 Lecture-General Biology II Sections 1-3 Spring 2010 received rubric scores of 3.0/5.0 on a written essay question presented on their 2nd and 3rd examinations. 42.2% of students achieved at least a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. 74.71% of Students in PCB3063 Genetics scored at least a 3.0/5.0 rubric score on a written capstone scientific paper assignment (polytene lab assignment) when assessed for writing skills. 93.34% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) received grades of 75% (3.75/5.0 rubric score) or better. 70.46% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

• **Indirect measures**

• **Fall 2009**

Fall 2009 No surveys or exit interviews were administered during this period. Spring 2010 No surveys were administered in Spring 2010. We will administer in Summer 2010.

• **Direct Measures**

• **Fall 2008**

70.9% of our students taking BSC1011 Lecture-General Biology II received rubric scores of 3.0/5.0 on a written essay question presented on their 3rd examination. 58.3% of students achieved a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. 71.01% of Students in PCB3063 Genetics scored a 3.0/5.0 rubric score on a written capstone scientific paper assignment (polytene lab assignment) when assessed for writing skills. 61.5% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) received grades of 75% (3.75/5.0 rubric score) or better. 51.9% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

**Spring 2009**

68.4% of our students taking BSC1011 Lecture-General Biology II Sections 1-3 Spring 2009 received rubric scores of 3.0/5.0 on a written essay question presented on their 2nd and 3rd examinations. 39.02% of students achieved at least a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. 74.41% of Students in PCB3063 Genetics scored at least a 3.0/5.0 rubric score on a written capstone scientific paper assignment (polytene lab assignment) when assessed for writing skills. 95.8% of seniors taking
their Oral Presentation Exit Exam administered in (BSC4930) Pro-seminar received grades of 75% (3.75/5.0 rubric score) or better. 72.72% of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

2007

**Direct Measures**

**Fall 2007**

Freshmen in General Biology II BSC1011 Fall 2007 and Spring 2008 were given an essay question on their 3rd semester exam (phylogenetics topic). The answers were assessed using a 0-5 pt “Writing rubric” developed by faculty within the Biological Sciences department. The average class rubric scores for this essay exam question were Fall 07 2.8/5.0 and Spring 08 3.2/5.0

Juniors in Genetics courses (PC83063 Fall 2007 and Spring 2008 were given a lab report essay questions on their Sordaria Fimicola gene linkage laboratory that concerned the inaccuracies found in gene mapping calculations. Their answers were assessed using a 0-5 pt “writing rubric”. The average class scores for this lab report essay question were Fall 07 2.8/5.0 and Spring 08 3.1/5.0

**Spring 2008**

Freshmen in General Biology II BSC1011 Fall 2007 and Spring 2008 were given an essay question on their 3rd semester exam (phylogenetics topic). The answers were assessed using a 0-5 pt “Writing rubric” developed by faculty within the Biological Sciences department. The average class rubric scores for this essay exam question were Fall 07 2.8/5.0 and Spring 08 3.2/5.0

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**Indirect Measures**

**Fall 2007-Spring 2008**

51% of sophomores responding to a survey regarding their perception of how the biological sciences program has improved their ability to communicate in written and spoken form indicated that the core curriculum courses greatly improved their ability to write and present publicly.
A senior exit interview and survey showed that 86% of senior students felt that their BS prepared them “very well” to communicate outside of the college environment.

2006

**Direct Goals**
- Every student will present orally in at least 4 classes. Presentation will be graded using a presentation rubric. (BSC1010L, BSC1011L, MCB3010, BSC4930).
- Every graduating student will receive a mean score of 75% in the Oral Presentation Exit Exam graded by a team of faculty members using an appropriate rubric. (BSC4930)
- Students will be required to complete written lab reports, critically critique scientific literature, or research papers (BSC1010L, PCB3063, MCB3010, PCB2033, BOT2313, BOT3303).
- Students will write a scientific paper that includes an abstract, introduction, materials and methods, results, discussion (BSC4930).

**Indirect Goals**
- All of the students graduating with a B.S. in Biology will have a minimum 2.0 in all Biology core classes.
- All of the program outcomes will be assessed by an exit interview and an exit survey.
- Responding to an Exit Interview, 80% of the graduating students will indicate that the biology department has helped them improve their oral and written communication skills.
- Responding to an Exit Survey, 80% of the graduating students will indicate that they feel confident in their ability to write a scientific paper.
- Responding to the Exit Survey, 70% of the students will indicate that are satisfied or well satisfied with their ability to scientifically communicate in both verbal and written communication.

**Direct Measures**

Fall 2006-Spring 2007

- All graduating seniors received a 70% on a oral presentation in BSC4930.
- In MCB3010, the average mean of a classroom presentation that was graded using a rubric was 94%.

**Indirect Measure(s)**
- All seniors that graduated Fall 2006, had at least a 2.0 gpa. Surveys that measure the perception of the department are given annually in the spring.
- Seventy-one percent of graduating seniors felt like the department helped increase their communication skills.
- One hundred percent of graduating seniors felt that they are satisfied or very satisfied with their ability to write a scientific paper or communicate in scientific writings.
Critical Thinking Skills:

Outcome:

- Graduates will be able to demonstrate the ability to use critical and creative thinking in designing and conducting experiments, analyzing and evaluating results, in the synthesis of solutions and relevant discussion in and in solving problems in the biological sciences.

Direct
- 75% of students completing a concept mapping exercise in Immunology PCB4233 will score 8.0/14 or better on the exercise. 50% of the Students completing a capstone project in Genetics known as the "Drosophila crossing experiment" will correctly identify the hereditary basis for the inheritance of 2 distinct traits carried in Drosophila fruit flies. 70% of these students will receive rubric scores of 3.0/5.0 or better on average as it relates to their "thought process" that led them to their conclusions. 50% of students in the BSC1011 (two sections) Biology II course will correctly identify and illustrate the phylogenetic relationships amongst their data sets. 60% will score 3.8/5.0 or better when evaluated by a GEAC CT rubric for Synthesis and Evaluation skills. 50% of Biology students taking the MFT will score a 48 or better on the analytical skills section of the MFT. 50% of Biology students taking the MAPP will score 112 or better on the analytical skills section of the MAPP test.

Indirect
- All of the program outcomes will be assessed by an exit interview and an exit survey. Students completing 45 hours will also be given a survey regarding their perception of the Department. Responding to the survey, 70% of the students will indicate that they are being well prepared to assess problems using the analytical reasoning skillfully.

Results:

2010

- **Direct Measures**
- **Fall 2010**
  - 80% of students completing a concept mapping exercise in Immunology PCB4233 scored 8.0/14 or better on the exercise. 48% of the Students completing a capstone project in Genetics known as the "Drosophila crossing experiment" correctly identified the hereditary basis for the inheritance of 2 distinct traits carried in their given Drosophila fruit flies. 75% of students who completed a capstone project in Genetics received rubric scores of 3.0/5.0 or better on average as it related to their "thought process" that led them to their conclusions when assessed using the GEAC CT rubric.. 71% of students in the BSC1011 (two sections) Biology II course correctly identified and illustrated the phylogenetic relationships amongst their data sets. 21% of BSC1011 students completing their phylogenetic systematic assignment scored 3.8/5.0 or better when evaluated by a GEAC CT rubric for synthesis and Evaluation skills. Assessment indicators for analytical skills were only made available as cohort data not individual. As a Cohort senior biology students scored an average of 44, likely below our 50% expected 44/individual 0% of Biology students taking the MAPP scored 112 or better.

  57% of students in the BSC1011 (two sections) Biology II course correctly identified and illustrated the phylogenetic relationships amongst their data sets. 43% of BSC1011 students completing their phylogenetic/systematic assignment scored
3.8/5.0 or better when evaluated by a GEAC CT rubric for synthesis and Evaluation skills. Assessment indicators for analytical skills were only made available as cohort data not individual. As a Cohort senior biology students scored an average of 43, below our 50% expected 20/individual.

- **Spring 2011**
  - No concept mapping was assigned in Spring 2011. 64% of the Students completing a capstone project in Genetics known as the "Drosophila crossing experiment" correctly identified the hereditary basis for the inheritance of 2 distinct traits carried in their given Drosophila fruit flies. 71% of students who completed a capstone project in Genetics received rubric scores of 3.0/5.0 or better on average as it related to their "thought process" that led them to their conclusions when assessed using the GEAC CT rubric.

- **Indirect**
  - Fall 2010- No surveys or exit interviews were administered in Fall 2010-Spring 2011. During an exit interview 78% of the students indicated that they were being well prepared to assess problems using analytical reasoning skills.

2009

- **Direct Measures**
  - **Fall 2009**
    - 78.2 % of students completing a concept mapping exercise in Immunology PCB4233 scored 8.0/14 or better on the exercise. 53.1% of the Students completing a capstone project in Genetics known as the "Drosophila crossing experiment" correctly identified the hereditary basis for the inheritance of 2 distinct traits carried in their given Drosophila fruit flies. 74% of students who completed a capstone project in Genetics received rubric scores of 3.0/5.0 or better on average as it related to their "thought process" that led them to their conclusions when assessed using the GEAC CT rubric. 68% of students in the BSC1011 (two sections) Biology II course correctly identified and illustrated the phylogenetic relationships amongst their data sets. 19% of BSC1011 students completing their phylogenetic/systematic assignment scored 3.8/5.0 or better when evaluated by a GEAC CT rubric for synthesis and Evaluation skills. Assessment indicators for analytical skills were only made available as cohort data not individual. As a Cohort senior biology students scored an average of 42, likely below our 50% expected 44/individual 0% of Biology students taking the MAPP scored 112 or better. Since no Bio students took the last MAPP.
61% of students in the BSC1011 (two sections) Biology II course correctly identified and illustrated the phylogenetic relationships amongst their data sets. 42% of BSC1011 students completing their phylogenetic/systematic assignment scored 3.8/5.0 or better when evaluated by a GEAC CT rubric for synthesis and Evaluation skills. Assessment indicators for analytical skills were only made available as cohort data not individual. As a Cohort senior biology students scored an average of 42, below our 50% expected 20/individual. This is 1 pt lower than the Fall 08 cohort 0% of Biology students taking the MAPP scored 112 or better. Since no Bio students took the last MAPP.

2008

- **Direct Measures**

  - **Fall 2008**

    84.4% of students completing a concept mapping exercise in Immunology PCB4233 scored 8.0/14 or better on the exercise. 51.6% of the Students completing a capstone project in Genetics known as the "Drosophila crossing experiment" correctly identified the hereditary basis for the inheritance of 2 distinct traits carried in their given Drosophila fruit flies. 71% of students who completed a capstone project in Genetics received rubric scores of 3.0/5.0 or better on average as it related to their "thought process" that led them to their conclusions when assessed using the GEAC CT rubric. 69.6% of students in the BSC1011 (two sections) Biology II course correctly identified and illustrated the phylogenetic relationships amongst their data sets. 16% of BSC1011 students completing their phylogenetic/systematic assignment scored 3.8/5.0 or better when evaluated by a GEAC CT rubric for synthesis and Evaluation skills. Assessment indicators for analytical skills were only made available as cohort data not individual. As a Cohort senior biology students scored an average of 41, likely below our 50% expected 48/individual. 0% of Biology students taking the MAPP scored 112 or better. Since no Bio students took the last MAPP.

**Spring 2009**

52% of students who completed a capstone project in Genetics received rubric scores of 3.0/5.0 or better on average as it related to their "thought process" that led them to their conclusions when assessed using the GEAC CT rubric. 58.7% of students in the BSC1011 (two sections) Biology II course correctly identified and illustrated the phylogenetic relationships amongst their data sets. 38% of BSC1011 students completing their phylogenetic/systematic assignment scored 3.8/5.0 or better when evaluated by a GEAC CT rubric for synthesis and Evaluation skills. Assessment indicators for analytical skills were only made available as cohort data not individual. As a Cohort senior biology students scored an average of 40, below our 50% expected 24/individual. This is 1 pt lower than the Fall 08 cohort 0% of Biology students taking the MAPP scored 112 or better. Since no Bio students took the last MAP.
Indirect measures
Fall 2008 No surveys or exit interviews were conducted. Spring 2009 No surveys were administered in Spring 2009. We will administer in Summer 2009.

2007

Direct Measures
Fall 2007-Spring 2008

Genetics Experiment:
65% of the Fall 2007 “junior students correctly resolved their problem finding the appropriate mode of inheritance. 72% of the Spring 2008 junior students students correctly resolved their problem finding the appropriate mode of inheritance.

BSC1011 Phylogenetics Exercise:
Using a GEAC critical thinking rubric, the average class rubric scores for this assignment were Fall 07 3.8/5.0 and Spring 08: 3.6/5.0.

Major Field Test- Analytical Reasoning:
The mean score for area9-“analytical reasoning” for FAMU seniors taking the BSF T (Biological Sciences Field Test), was 37% compared to the national mean of 53%.
Students on average responded incorrectly 3% of the time to these CT questions.

2006

Direct Goals
- Case studies, scientific projects, biological simulations and lab exercises will be required in ALL biology courses.
- A subset of question in the Major Field Test will be used to assess the students’ ability to think critically.

Indirect Goals
- All of the students graduating with a B.S. in Biology will have a minimum 2.0 in all Biology core classes.
- All of the program outcomes will be assessed by an exit interview and an exit survey.
- Students completing 45 hours will also be given a survey regarding their perception of the department. Responding to the survey, 70% of the students will indicate that they are being well prepared to assess problems using the scientific method.
- Responding to an Exit Interview, 80% of the graduating students will indicate that they are satisfied or very satisfied with their ability to think critically.

Results 2006
Direct Measures
Fall 2006-Spring 2007

In MCB3010 (Microbiology), students determined the identity of an unknown bacterial species. The assignment required vast amounts of critical thinking skill, and the class average was 79.7%. In a section of BSC1010, students were required to complete Mendelian genetics problems. The students completed 42% of the questions that required critical thinking correctly.

Indirect Measure(s)
Fall 2006-Spring 2007

All seniors that graduated Fall 2006, had at least a 2.0 GPA. Surveys that measure the perception of the department are given annually in the Spring.

2. Requirements in these two areas reflected in files at accreditation organization site:

SACS requirements for these areas can be found at:

http://www.sacs.org/

and here:

http://sacscoc.org/principles.asp

3. Industry standards and competencies tested in licensure examinations.
N/A

4. Provide any summary results of assessment that demonstrate graduates have met writing proficiency and critical thinking goals, preferably for the past five to ten years.

Communication Skills
In 2004-2005 our assessment of oral communication skills was assessed based on students scoring 75% on an oral presentation exit exam graded by a team of faculty using an appropriate rubric. The results showed that during the review period 99% of students received 80% or better on their oral presentation exit exam. All graduating students met this benchmark. Over the 2006-2008 assessment period these statistics did not change with the number of A's and B's distributed per semester remaining the same. In addition to this instrument four courses were chosen to also assess oral communication skills. The 2004-2005 baseline data was 100% of students assessed in those courses received 80% or higher. In 2006-2007 this baseline was improved to 81% with a mean score of 94% on the oral presentation assignment throughout the 4 courses. In 2007-2008 the convention of the
baseline was changed to a rubrics scores out of 5.0. The mean scores for the oral presentations assignment throughout the 4 courses under this convention was 3.4/5.0 during this period. Because of the convention change these data are not directly comparable but can be compared to upcoming 2008-09 data that will employ the same rubrics evaluation system.

Written communication was not directly assessed in 2004, however in 2005 the assessment of lab reports and a scientific paper using a writing rubric was initiated but no quantitative baseline was established. The first useable baseline data for written communication skills was presented in 2007-2008. This involved rubric graded Genetics, organismal biology and professional seminar lab reports, exam questions, and scientific papers respectively. The baseline mean scores for these assignments averaged circa 3.1/5.0 on this rubric. We had proposed to improve upon this baseline in our most recent assessment plan by taking a more proactive approach to getting students to take actions to better their writing skills; such as initiating pre-test in writing skills to identify weak writers and then get them over to the appropriate writing lab resources available to students. We will also follow-up their progress in these efforts and use post-test to measure their improvement. The 2008-2009 period showed improvements over the previous base line year 71.2 % of our students taking BSC1011 Lecture-General Biology II received rubric scores of 3.0/5.0 on a written essay question presented on their 3rd examination an improvement of 2% points. 61.2 % of students achieved a 3.8/5.0 rubric score or 76% on their BSC1010L General Biology I Lab 6 page written report in its post-assessment evaluation. This corresponded to a modest 3.4% increase from the 2007 baseline achievement.

Students in Genetics averaged 3.0/5.0 rubric score on a written capstone scientific paper assignment. Also 60.2% of seniors taking their Oral Presentation Exit Exam administered in (BSC4930) received grades of 75% (3.75/5.0 rubric score) or better this was consistent with the previous years totals. 52.4 % of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation. In 2010-2011 3.6 % of our students taking BSC1011 Lecture-General Biology II received rubric scores of 3.0/5.0 on a written essay question presented on their 3rd examination an improvement of 2.4% above these scores in Fall 2008. Genetics on the written capstone scientific paper assignment also showed marginal increases (2.1%). The Oral Presentation Exit Exam showed 61.7 % of freshmen students presenting a group Oral Presentation administered in (BSC1010L) received grades of 70% (3.5/5.0 rubric score) or better on their overall presentation. Generally this is higher averaging around 80% of the class.

In the MS Program Oral Communication and Written Communication skills are assessed via Graduate Seminar courses, an oral Defense, a written prospectus and a written thesis 100% of students in the MS program have maintained “B” grades in their graduate seminar courses and on their written prospectus and a written thesis. Since our Master's program is in its infancy and it is advanced studies program no significant trends of improvement in these areas has yet to observed. Rather we have demonstrated consistency in high-level performance in the areas of Oral Communication and Written Communication.

**Critical Thinking Skills**

Multiple methods of assessing critical thinking were employed over the review period with mixed results in terms of improving student learning outcomes. All Biology students had to do these assessment exercises except for the concept mapping exercise.

Assignments ranging from essays, case studies, reports, essay exam questions and lab reports are used to assess critical thinking. Also employed are capstone papers, lab report write-ups, concept mapping exercises in immunology/non-majors biology courses, and cladogram exercises in organismal biology courses that challenge students to conceptualize morphological inter-relationships in the process of an organisms evolutionary history. In the current review period 2010-2011 we have adapted the use of new rubrics for grading artifacts on critical thinking. Learning outcomes involving **Critical Thinking**
skills, have been assessed recently by these rubrics specifically named "GEAC CT rubrics.

We have also just begun (2008-2011) to extract relevant critical thinking student learning outcomes from the university administered Measure of Academic Proficiency Pilot (now renamed) test (MAPP) which presents argumentative essays. We have likewise extracted CT skills data for review and analysis from the department administered MFT/BSFT test which test student's ability to solve analytical field specific problems involving biology themes. MFT Critical Thinking data was first implemented in the 2005 academic year. The results from these standardized exams is provided in a manner that separates outcomes for these analytical sections from content knowledge sections as to facilitate specific monitoring of a student's reasoning capabilities and tracks improvements in subsequent re-assessments.

Academic Learning Compact Reports demonstrate gains are being made in critical thinking. In Immunology PCB4233 we utilize concept mapping exercises. The scores on these exercises have shown 3% gains since their initial employment in 2007. In Fall 2010, 80% of students completing a concept mapping exercise scored 8.0/14 or better on the exercise. The capstone project in Genetics known as the "Drosophila crossing experiment" also has demonstrated marginal increases in student performance. Fall 2010 saw a 20% gain over Fall 2009. These gains may partially be attributed to changes in pedagogy including active learning exercises in both lecture and lab. This experiment is highly analytical and employs both evaluation and synthesis skills at the upper levels of the blooms taxonomy criteria for critical thinking skills.

E. Are professors required to integrate writing proficiency and critical thinking into all courses? If so, what oversight is provided to ensure that these skills are being taught? How are these skills integrated into course assessments?

1. Responsibilities of faculty members related to integrating writing and critical thinking into course assessments:

Not all courses but certain courses are selected for actual assessment and evaluation of writing and critical thinking skills. Subsequent follow-up includes modification of goals and objectives and measures.

For example for Writing Skills:

- The BSC1011 Lecture-General Biology II issues a written essay question on their 3rd examination tied to writing skills and evaluated using a writing-skills rubric.
- The BSC1010L General Biology I issues a 6 page written report that addresses written communication skills and which also uses a writing skills rubric for evaluation.
- The PCB3063 Genetics course has written capstone scientific paper integrated into its curriculum that is evaluated for writing skills using the writing skills rubric.
- The BSC 4930 course issues an Oral Presentation Exit Exam to assess oral communication skills and uses a presentation rubric to evaluate students.
group Oral Presentation administered in (BSC1010L) will receive grades of 70% (3.5/5.0 rubric score) or better on their overall presentation.

For example for CT Skills:

- The PCB4233 Immunology course issues a concept mapping exercise which test analysis skills

- The PCB3063 Genetics course has a written capstone scientific paper integrated into its curriculum that is evaluated for critical thinking based on the student analytical "thought process" that leads them to their drawn conclusions regarding the inheritance of certain traits.

- In the BSC1011 (two sections) Biology II course students will correctly identify and illustrate the phylogenetic relationships amongst their data sets a process that is very heavy on analysis skills

2. Oversight to ensure that institutional individual programs are executing and integrating these measures into their curriculum include:

The Office of Assessment: This office instituted an assessment program termed FAMOUS which is a university-wide assessment program that promotes continuous improvement. It was initially adopted and instituted in 2004. These assessment activities permeate all levels of the university and target four primary areas: entry-level knowledge and skills; general education outcomes; program/divisional outcomes; and students, graduates and alumni satisfaction. An Institutional Level Assessment Committee (ILAC), established by the Provost who formally oversees the assessment program, guides and monitors the assessment efforts and use of assessment results for improvement. As a derivative of ILAC, the Departmental Level Assessment Committee (DLAC) then provides leadership in the design, development and implementation of its own systematic program assessment plan and oversees assessment activities and continuous improvement as ascribed under the FAMOUS Assessment Approach. In this instance the DLAC is entitled BSAC: Biological Sciences Assessment Committee. BSAC as a committee over the review period of 2004-2008 has proactively developed assessment tools such as rubrics to assess the aforementioned seven major learning outcomes. BSAC has also created and submitted within this same review period four institutional program (IP) assessment plans for 2004-2005, 2005-2006, 2006-2007 and 2007-2008. The format for each of these assessment plans is based on the acronym F.A.M.O.U.S. of which each letter corresponds to a specific "step" in the execution of the assessment process. These are defined as follows.

Step 1: Formulating statements of outcomes/objectives aligned to the institutional mission/goals;  
Step 2: Ascertaining criteria for success;  
Step 3: Measuring student/service performance using qualitative and quantitative methods;  
Step 4: Observing and analyzing results for congruence between expected and actual outcomes;  
Step 5: Using the results to effect improvement of instructional programs and administrative and educational support services; and  
Step 6: Strengthening programs and services by continuously
evaluating, planning, allocating resources and implementing new approaches to ensure congruence between expected and actual outcomes.

In the written assessment plan the programs goals and learning outcomes are summarized initially in the 1st four paragraphs. Subsequently each individual learning outcome is stated in "STEP 1" or "F" followed by the plan to assess that outcome in "STEPS 2 and 3" or "A" and "M". And this is followed by one's assessment results/data/observations of that outcome in "STEP 4" or "O" and lastly by your plans for how you will use the assessment results from step 4 to improve and strengthen the program in "STEPS 5 and 6" or "U" and "S". In our program we have 5 current primary outcomes (1. content knowledge.... 5. laboratory skills), which means we will have to carry out steps 1-6 five times, once for each outcome. Additionally, we must have separate assessment plans for our biology BS degree program, BSTE, biology teacher's education program and our biology MS degree program. Each of these having their own specific twist on the major learning outcomes with each outcome requiring steps 1-6 to be formulated, executed, observed and adapted with a net result of program improvement.

Within the Biological Sciences Program the specific methods of assessing the five major student learning outcome areas, as presented in steps 2/"A" and 3/"M" of our FAMOUS assessment model plans, has been dynamic and changing throughout the review period (2003-2008)

Another oversight for ensuring the integration of writing and CT skills into courses is the curriculum committee.

3. Please include any state mandated writing and critical thinking requirements.

Academic Learning Compacts:

The support for Writing and Critical Thinking as an area of academic concern that has been established for some time. The Board of Governor's of the State University system of Florida using a variety of instruments deemed in a memorandum dated October 9, 2006, that three areas; content knowledge, communication skills and critical thinking (3C's) were of vital concern and required additional actions to "ensure student achievement in Florida baccalaureate programs" (Appendix G). Each state university in Florida was required to develop "Academic Learning Compacts" according to the state policy guideline #PG 05.02.15 (Appendix H). Every discipline under this mandate is required to provide students with clear guidelines on their core learning expectations in all three areas. External validations were also mandated to corroborate that graduates have truly attained the expected core competencies. What this tells us is that the Academic Learning Compacts submitted across the curricula are designed by state mandate to include critical thinking assessments and that both internal and external validations must be conducted, which collectively mean that a plethora of direct measurements of critical thinking potentially exists on campus via the manifestations of these assessment plans.

There are reports on Critical Thinking and ALCs conducted by the Office of Assessment, dated 6/1/2007 (e-document unavailable) and 3/28/2008 (Appendix H).
4. Course syllabi- which have prompts indicating the requirement for written exercises and critical thinking exercises along with artifacts are included as (Appendices I-N)

F. Do you have measurable goals for student success after graduation? If so, please send me the goals and the results for the last five to ten years.

Information in the following two categories would be useful:

1. Any goals the programs have relative to student success in the form of outcomes such as percent of graduates finding employment within a specified time:
   - **Measure:** 80% of our Biology students should be able to get admission to graduate professional student or gain employment. As measured by interview or electronic survey
   - **Result:** 65% of our FAMU biology students on average over the past five years were able to get admission to graduate professional school and or gained employment in areas related to biological sciences.

2. Any goals the programs have relative to student success in the form of average salaries garnered by recent graduates
   - **Measure:** 100% of students in science education will find jobs that pay a range of $36,000 per year in Florida state based schools
   - **Result:** 100% of students in our science education program 2005-2010 were able to find teaching jobs paying $36,000 within Florida state school system.

3. Any goals the programs have relative to student success in the form of types of jobs graduates find, etc.
   - 100% of students in science education will find jobs in teaching.
   - 100% of students in our science education program 2005-2010 were able to find teaching jobs.

4. Any goals the programs have relative to student success in the form of alumni who have gained prominence in the profession.
   - 5% of biology graduates over a ten year span will become prominent
   - 1.6% have achieved prominence

5. Note any alumni who have achieved prominence:

   **Listing of Select Prominent Department of Biology Graduates**
   - Dr. Walter Cromwell– Chief resident. University of Chicago
   - Dr. Jodrecka Brown- Director: Center of Excellence
| Brooks-Walter, Alexis | BS Degree: Spring 1992  
|                       | Major: Biology       
|                       | Ph.D. Degree: Univ. of Alabama @ Birmingham-Microbiology, 1999 | Employed: Bethune-Cookman University – Biology Department |
| Wilson, Kennessa      | BS Degree: Spring 1994  
|                       | Major: Biology       
|                       | MD Degree: Spring 1998, University of Miami | Physician, Family Practice, Capital Health Plan, Tallahassee, FL |
| Bryant, Acquinonette | BS Degree: Spring 1995  
|                       | Major: Biology       
|                       | MD Degree: PIMS Program, FSU/UF, Spring 2001 | Physician, Army Military Base, North Dakota |
| Croskey, Djenabra     | BS Degree, Spring 1995,  
|                       | Major: Biology       
|                       | MD Degree: Howard, University, Spring 1999 | Physician, Tampa, FL |
| Reed, Yolanda         | BS Degree: Spring 1993  
|                       | Major: Biology       
|                       | MD Degree: Spring 1997 Howard University, Internship: Duke University | Physician, Family Practice, Washington, DC |
| Brown, Joedrecka     | BS Degree: Spring 1994  
|                       | Major: Biology       
|                       | MD Degree: Emory University Spring 1998 Internship: Jacksonville Hospital Residency: University of Chicago | Medical Director for the Community Center of Excellence in Women Health, Clearwater, FL |
| Hamilton, Nikki       | BS Degree, Spring 1995  
|                       | Major: Biology       
|                       | DVM Degree: University of Florida, Spring 2000 | Veterinarian, Pet Smart, Atlanta, GA |
| Miller, Alfreda       | BS Degree: Spring 1995  
|                       | Major: Biology       
|                       | MD Degree: Univ. of So. Carolina, Spring 1999 Residency: Univ. of Alabama @ Birmingham – (Anesthesiology) | Anesthesiologist, Maryland |
| Walker, Valencia      | BS Degree: Spring 1995  
<p>|                       | Major: Biology       | Neonatologist, Mattel’s Children’s Hospital UCLA, Los Angeles, CA |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Education Years</th>
<th>Major</th>
<th>Degree(s)</th>
<th>Employer/Position</th>
</tr>
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<tbody>
<tr>
<td>Johnson, Courtney</td>
<td>Spring 1997</td>
<td>Biology</td>
<td>MS Degree &amp; Ph.D. Degree: UF</td>
<td>Professor, College of Education, University of Florida</td>
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<td></td>
<td></td>
<td></td>
<td>Science Education</td>
<td></td>
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<tr>
<td>Scott, Cherise</td>
<td>Spring 1997</td>
<td>Biology</td>
<td>M.S. Degree (Epidemiology) – 1998, Florida A&amp;M University;</td>
<td>Employer: Global Alliance For TB Drug Development (TB Alliance Scientific Liaison to the Stop TB Partnership Working Group on New Drugs; Founder/Director, CLEAR, Inc (Capacity for Leadership Excellence and Research)</td>
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<td></td>
<td></td>
<td></td>
<td>Ph.D Degree: Johns Hopkins University, Spring(2007) - Vaccines</td>
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<tr>
<td>Canty, Natosha</td>
<td>BS Spring 1998</td>
<td>Biology</td>
<td>M.S. Degree: Florida A&amp;M University</td>
<td>Physician; CHP, Tallahassee, FL</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Epidemiology (Spring 2001)</td>
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<td></td>
<td></td>
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<td>Medical School: FSU</td>
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<tr>
<td>Davis, Johnny</td>
<td>BS Spring 1999</td>
<td>Biology</td>
<td>Ph.D. Degree: University of Florida - Microbiology, Summer 2006 PostDoc: University of Georgia</td>
<td>Employer: USDA</td>
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<tr>
<td>Donald, Chancellor</td>
<td>BS Fall 1998</td>
<td>Biology</td>
<td>M.D. Degree: University of Miami - School of Medicine, Spring 2004 Residency: Tulane University</td>
<td>Physician: Louisiana</td>
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<td>Haynes, Karmella</td>
<td>BS Spring 1999</td>
<td>Biology</td>
<td>Ph.D. Degree: Washington University</td>
<td>Professor, University of Arizona</td>
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<td>Name</td>
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<tr>
<td>Sarjeant, Keawin</td>
<td>Graduated: Spring 1999</td>
<td>Assistant Professor; CESTA, FAMU</td>
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<td></td>
<td>Major: Biology</td>
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<td>M. S. &amp; Ph.D. Degree: University of Florida – Animal Science</td>
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<tr>
<td>Barnes, Kiono</td>
<td>Graduated: BS Spring 2000</td>
<td>Private Dental Practice; Biloxi, MS</td>
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<td></td>
<td>Major: Biology/Pre-Med</td>
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<td></td>
<td>Dental Degree: Univ. of Florida (Fall 2004)</td>
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<tr>
<td>Burton, Kendrea</td>
<td>Graduated: BS Spring 2000</td>
<td>Private Dental Practice; Houston, TX</td>
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<td>Major: Biology</td>
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<td>Dental Degree: Univ. of Alabama @</td>
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<td></td>
<td>Birmingham, Spring 2004</td>
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<tr>
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<td>Major: Biology</td>
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<tr>
<td></td>
<td>Ph.D. Degree: Florida A&amp;M University – Pharmacology/Toxicology, Spring 2006</td>
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<tr>
<td>James, Jesse</td>
<td>Graduated: BS Spring 2000</td>
<td>Private Practice; New York, NY</td>
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<td>Major: Biology</td>
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<td>M.D. / MBA Degree: Yale University School of Medicine, Spring 2006</td>
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<td>Sissle, Christopher</td>
<td>Graduated: BS Spring 2000</td>
<td>Private Veterinary Practice; California</td>
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<td></td>
<td>Major: Biology</td>
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<td>DVM Degree: UF, Spring 2005</td>
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<td>Mills, Judith</td>
<td>Graduated: BS Spring 2001</td>
<td>Family Practice attending at MeritCare Clinic/North Country Hospital, Bemidji, Minnesota</td>
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<td>Major: Biology</td>
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<td>M.D./MBA Degree: New York City School of Osteopathic Medicine / NYIT, Spring 2006</td>
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<td>Scott, Kanesha</td>
<td>Graduated: BS Spring 2001</td>
<td>Practicing Dentistry in Chicago</td>
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<td>Major: Biology</td>
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<td>Dental Degree: Meharry School of Medicine, Spring 2006</td>
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<td>Keys, Kristina</td>
<td>Graduated: BS Summer 2001</td>
<td>Employed: Emory University Emory Vaccine Center: Yerkes National Primate Research Center</td>
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<td>Major: Biology</td>
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<td>M.S. Degree – Molecular Genetics Georgia State University – Summer 2002</td>
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<td>Ph.D. Degree Morehouse School of Medicine, Biomedical Science 2010</td>
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<tr>
<td>Henry, Curtis</td>
<td>Graduated: BS Spring 2003</td>
<td>Postdoc at University of Colorado</td>
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<td>Major: Biology</td>
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6. Any goals the programs have in terms of what competencies students should be able demonstrate upon employment in the profession

Proficiency in the competencies is assessed through the FTCE examination and through the Field Test and through the curriculum. For comprehensive data see content knowledge in Appendix B-E also see Appendix A.

Below is a sample of goals from 2009-2010 academic year:

**Direct**

Final Exam score analysis for the five General Biology courses assessed will show that at least 70% of the students will receive a score of 60% or better on these cumulative content specific final exams. Each semester students taking the MFT will obtain scores of at least 45 or better on average in each of the four assessed subject areas on the Biology MFT this corresponds generally to a score ~16% below the National Means in these areas.

**Indirect**

Responding to the survey of student perception of the efficacy of their training in Biological Science content areas, 70% of the students will indicate that their knowledge in each of the core areas has "greatly improved" relative to their knowledge in these areas upon entry into the program. Responding to an Exit Interview, 80% of the graduating students will indicate that their training in each curriculum course has empowered them to proceed with confidence and success towards their next educational or career aim (i.e. Graduate school, Medical School, Education).

7. Working students who received MS from Biology Department over the past six years:

- 1 Rebecca Buggs-Teaching K-12
- 2 Charmaine Thompson- Biotechnology Industry
- 3 Uyen Lee- Teaching K-12
- 4 Aja Lampley- Teaching K-12
- 5 Zekiya Ross- Biotechnology Industry
- 6 Augustine Nkembo-Teaching Assistant
- 7 Camille Webster-Teaching Assistant
- 8 Rashieri Smalls- Biotechnology Industry
- 9 William McClaine- Biotechnology Industry
- 10 Cynthia Jones- Teaching Assistant
8. Graduate Students with MS from Biology in Medical School or PhD programs
   - 1 Michael Ruden-PhD
   - 2 Augustine Nkembo-PhD
   - 3 Camille Webster-PhD
   - 4 Taj Shelton-Med
   - 5 Cynthia Jones C-PhD
   - 6 Jermaine White-White
   - 7 David Bauer-PhD
   - 8 Mimi-Med
   - 9 Sheila Fil-Aime-PhD
   - 10 Brittni Jones B-Med

M. What programs do you have to educate students regarding job opportunities? What are your measureable goals for each program? Do you use information similar to the data available from the Florida education and Training Placement Information Program (FETPIP) to prepare students prior to admission and prior to selection of major? Please provide me the results for the last five to ten years.

1. State the mechanisms in place at the program or college level to educate students regarding job opportunities.

   BSC3926 Professional Development (Course description) The BSC3926 is a course designed for biology majors to participate in seminars given by scientists and to engage in activities for professional development. Ms. Letina Banks the Biology Lead Advisor has developed programs within biology for Academic and Career Counseling. Additionally we have regularly invited representatives from medical, dental, chiropractic, and veterinary schools to speak with the students. Also we invite industry representatives such as from Proctor and Gamble and Eli Lilly to speak with our students about post graduate employment. Further, Undergraduate coordinators also provide information pamphlets on these topics to all students.
2. Measurable goals for each program regarding education about job opportunities and student placement.

- 90% will receive educational training regarding job opportunities via BSC3926
  - Over the past 5-10 years 100% have received this training

Also see: Appendix O – BSC 3926 Syllabus

Q. Please provide me with any additional information you think may be helpful, including your thought process to make sure we are headed in the right direction.

1. Provide data and other specifics on how your programs are addressing workforce needs in some significant way.

Health and Life sciences trainees all must pass through biology courses for training. Nursing students must take BSC1010 and BSC1011 taught by biology faculty. Pharmacy majors must take BSC1010 and BSC1011 taught by biology faculty. Dental, Veterinary, and Medical School applicants must take BSC1010 and BSC1011 along with Anatomy and Physiology. OPT agriculture. In training students in these programs we contribute significantly to African Americans that will become employed in these areas particularly because our demographic of these students is >90% African Americans and at least 70% of students that pass through these classes get their nursing degree and certification or complete their pharmacy certification or get accepted in medical school programs. Also many will go on to graduate school and get jobs teaching or research. Our education students all get jobs in teaching within on year of graduation.

Related is an excerpt from www.cpst.org

“Despite the gains in preparing for careers in science and engineering, African Americans face an upward climb in penetrating the U.S. S&E workforce. In 1997, there were 12,530,700 persons in the science and engineering workforce, of whom 10,585,600, or nearly 85%, were actually employed in science and engineering. However, of those employed in S&E, only 5.3% (555,600) were African Americans, and this proportion did not change appreciably during the 1990s, according to data obtained from the National Science Foundation SESTAT Database.

The proportion of African Americans employed in science and engineering varied by field of degree. African Americans were much more likely to be social and behavioral scientists and less apt to be engineers or physical, computer or mathematical scientists. For example, only 2.6% of the 1.9+ million engineers, 3.2% of the 679,700 physical and earth scientists, and 4.4% of the life scientists were African Americans.

Collectively, the department of biological sciences by contributing well trained predominantly African American students is acting to effect change in these employment disparities.

Of note is the following data from the National Science foundation:
“The top three institutions awarding bachelor’s degrees to African Americans in science and engineering in 1996 were North Carolina Agricultural and Tech State University (485), Norfolk State University (431) and, Florida Agricultural and Mechanical University (415) - all HBCUs. The top three schools awarding bachelor’s degrees in the broad fields of science and engineering. The majority of these institutions are HBCUs. The role of the HBCUs may become more pinnacle in the education of African Americans in science and engineering with the award of more than $42 million over five years by the National Science Foundation to promote the participation of members of underrepresented minority groups in engineering, mathematics, science and technology.”