University of NORTH ALABAMA 1830

Date June 30, 2011

Academic Department Five-Year Review

Physics and Earth Science

Physics
and
Earth Science

Brenda H. Webb
Department Chair

Departmental Assessment

1.0 Enrollment and Faculty

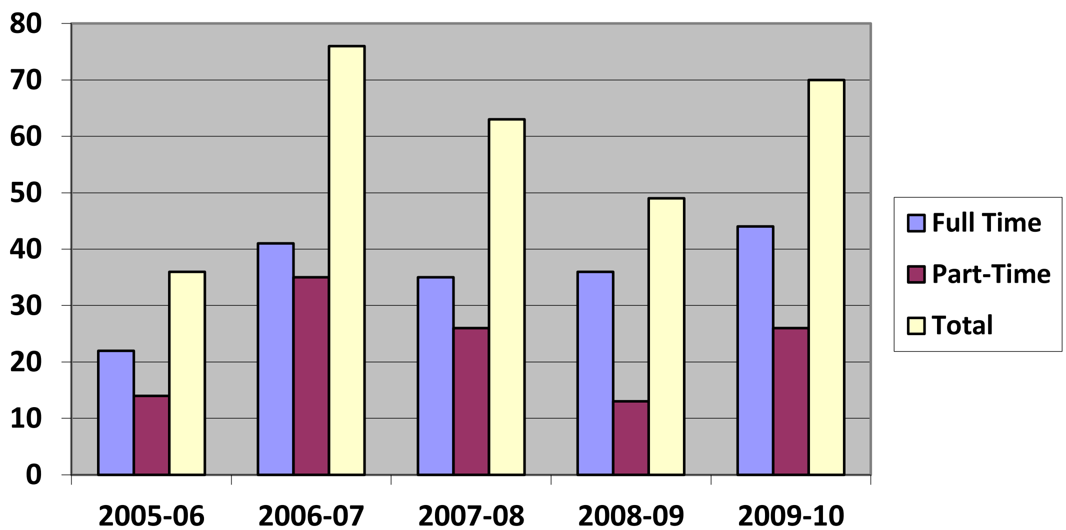
1.1 Enrollment

Duplicated Undergraduate Majors

The trend in the data presented in Chart 1 indicates variable levels of enrollment in majors. The downward trend from 2006-2007 to 2008-09 likely reflects the loss of Geology as a major at the University. It also can represent the national trend of fewer college students enrolling in science. However, 2009-2010 declarations of physics and general science education majors (included) may be an upturn in numbers of majors or may become an outlier as data continue to be aggregated. It is important to note that the number of part-time students who declared majors during the fall of 2006 and spring of 2009 averaged 39.5 % of the total. Upon further examination of this data, times of course offerings could change in the future as a result of this information.

Chart 1
Majors Enrolled in the Physics and Earth Science Department

Number of Duplicated Undergraduate Majors 2005-2006 through 2009-2010

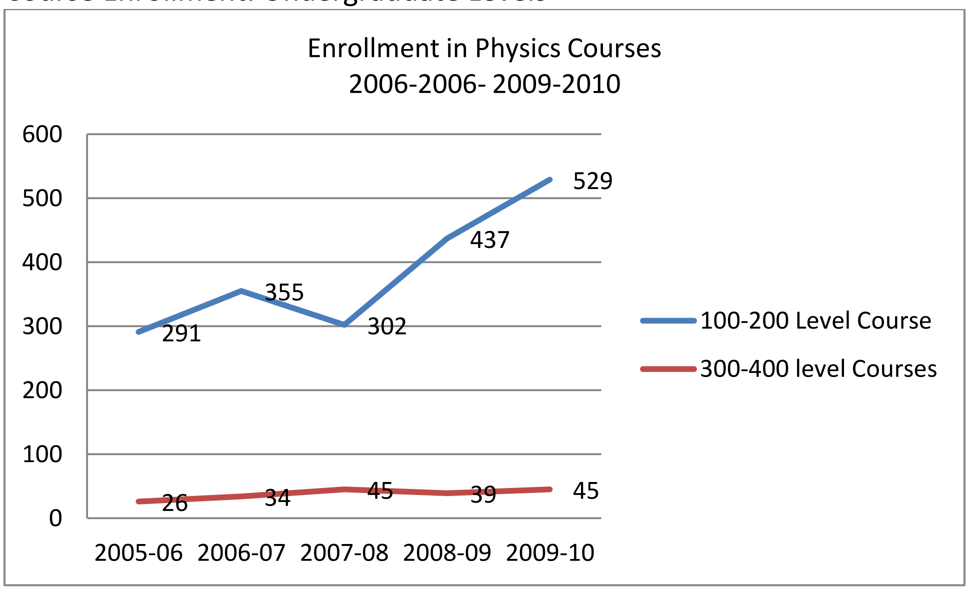


Data Source: Office of Institutional Research, Planning, and Assessment

The number of students served in the 100-200 level of physics courses continues to increase as indicated in Chart 2. This is evidence for the level of support for the general education at the university. The upper levels, 300 and 400, are taken less frequently by the general student population. The enrollment post-2005-2006 remains fairly consistent.

Chart 2
Enrollment Data for Physics Courses
2006-2007 through 2009-2010

Course Enrollment: Undergraduate Levels



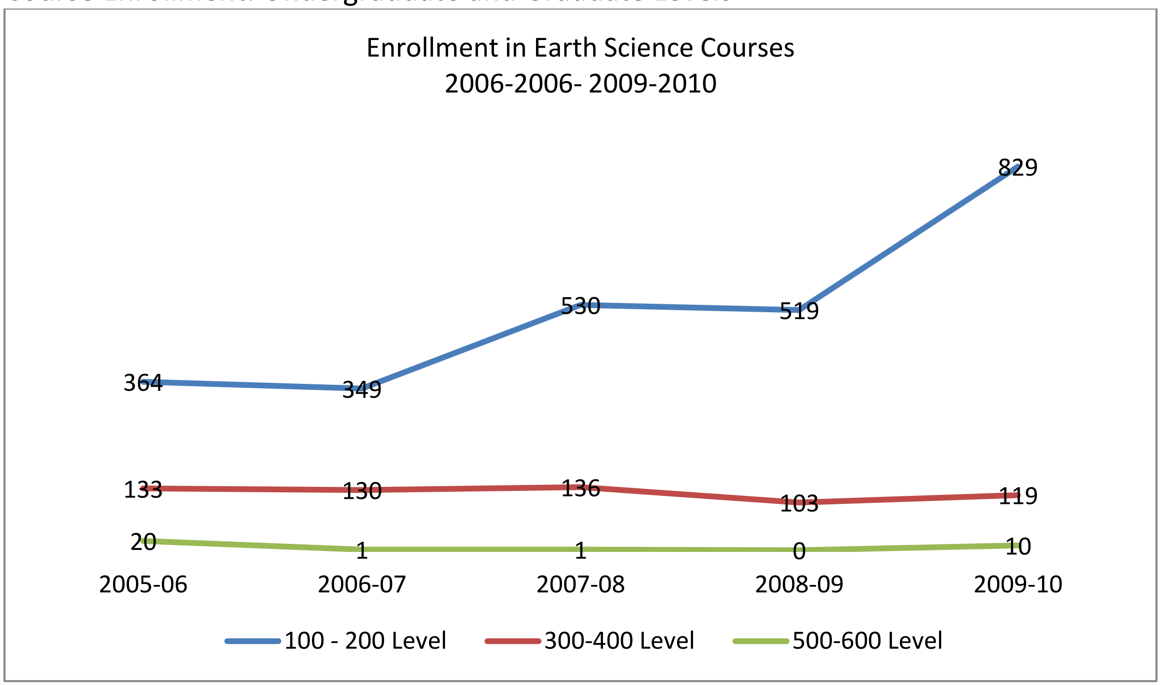
Data Source: Office of Institutional Research, Planning, and Assessment

Note that data were adjusted in 2005-2006 due to laboratory registration changes in 2007.

The Department of Physics and Earth Science contributes to the general education component of university students through Earth Science offerings as well. Data related to enrollment indicate a growth trend in the Introductory level courses offered in the Earth Sciences; fairly stable enrollment in the 300-400 level courses which are taken by physics majors and general science education majors; and a beginning growth trend in graduate courses. See Chart 3. At the 100-200 level, the introductory astronomy course was reintroduced into the curriculum in 2007-2008 along with the change in Earth Science lecture numbers for some classes. Classes which had been capped at 16-18 were changed to 34-36. The 2009-10 data indicate a dramatic change in the Earth Science enrollment; while growth was apparent to the casual observer in terms of additional sections of ES 121 (lecture and laboratories) being offered and a need for an increased number of classrooms, it is unlikely that the increase was greater than 300 students as illustrated in Table III. Growth in the context described may indicate that enrollment in the introductory courses is limited by available space and faculty available at this time.

Chart 3
Enrollment Data for Earth Science Courses
2006-2007 through 2009-2010

Course Enrollment: Undergraduate and Graduate Levels



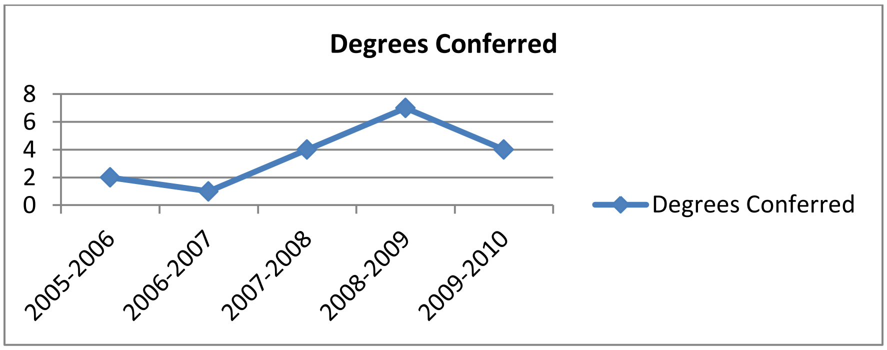
Data Source: Office of Institutional research, Planning, and Assessment

Note that data were adjusted in 2005-2006 due to laboratory registration changes in 2007.

1.2 Graduation Data for Department Majors and Minors along with Program Productivity

The number of degrees conferred ranged from 1-7 with the average of 3.6 per year as indicated in Chart 4. The year 2008-2009 is an outlier. A total for the period of time is 18.

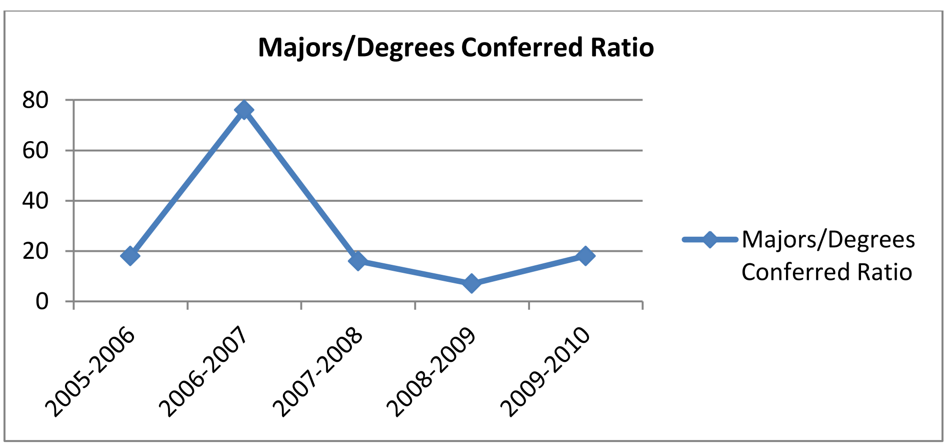
Chart 4
Number of Degree Conferred
2005-2006-2009-2010



Data Source: Office of Institutional Research, Planning, and Assessment

Trends the ratio of majors to degrees conferred are shown in Chart 5. The year 2006-2007 data appears to be an outlier.

Chart 5
Ratio of Majors to Degrees Conferred



Data Source: Office of Institutional Research, Planning, and Assessment

1.3 Student Services

In 2009-2010, under the initiative guidance of a physics faculty member, Dr. Mel Blake, the UNA Chapter the Physics Honor Society, Pi Sigma Pi, was reinstated. New members inducted included currently enrolled students (2), recently graduated students (2), and faculty (5). Additionally, a UNA Physics club meets weekly and involves physics majors and general education students across campus who are interested in the activities of this group.

In 2009-2010, the Department sponsored the exploration for the establishment of a University of North Alabama Chapter of the National Science Teacher Association which involves elementary and secondary science preservice teaching candidates. This effort was supervised by the Science Teaching Methods faculty member and Department Chair.

1.4 Outcome Information-- including Student Performance on licensure/certification exams, job placement of graduates, student, alumni and/or employer surveys

The Department began to contact alumni and is in the process of improving data collection of graduates and their successes—especially the International students. Physics students, in this country, are successful in entering graduate schools and the workforce.

<u>Major Field Tests</u>--The Department of Physics and Earth science led the way to creating accountability in expecting identified benchmarks in the preparation for taking the Major Field Test (MFT) and the GRE-Physics exam. Students will now enroll in the Senior Assessment Seminar (in 2010-2011 catalog) which is designed to prepare them for the kinds of problems they are likely to encounter on these exams. The course is a credit bearing course of one credit hour. The grade is a Pass/Fail.

<u>Assessment-based Planning</u>

<u>A.</u> The faculty determined that students did not take their performances on the nationally normed tests seriously. The Seminar course was developed because students' scores consistently fell below the Mean of the national scores and there was deemed to be a need to link concentrated preparation to their performance.

<u>B.</u> An exit survey will be administered prior to graduation to assess plans and obtain future contact information concerning graduates' activities.

1.5 Other

Departmental goals will be identified later in this document.

2. Assessment of the Department as it Relates to Faculty

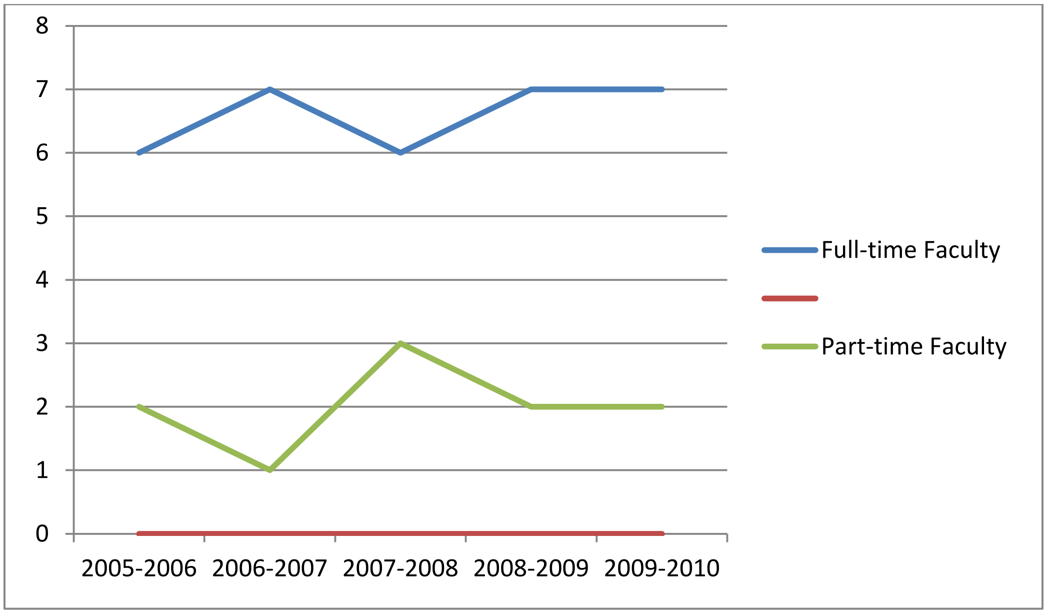
2.1 Teaching Productivity and Activities Designed to Enhance Teaching and the Curriculum.

Faculty

In this five year period of time, one full time, tenured faculty position was added through a gradual transfer of a member of the College of Education to this department. This faculty member had taught science teaching methods courses for a number of years in this department. Another position was filled as a non-tenured track. Ideally, this will be changed when this faculty member completes a Ph. D. in seismic studies. Only one of these positions was a new position/faculty line. Seven full-time faculty members teach in the department at the time of this writing. See Chart 6.

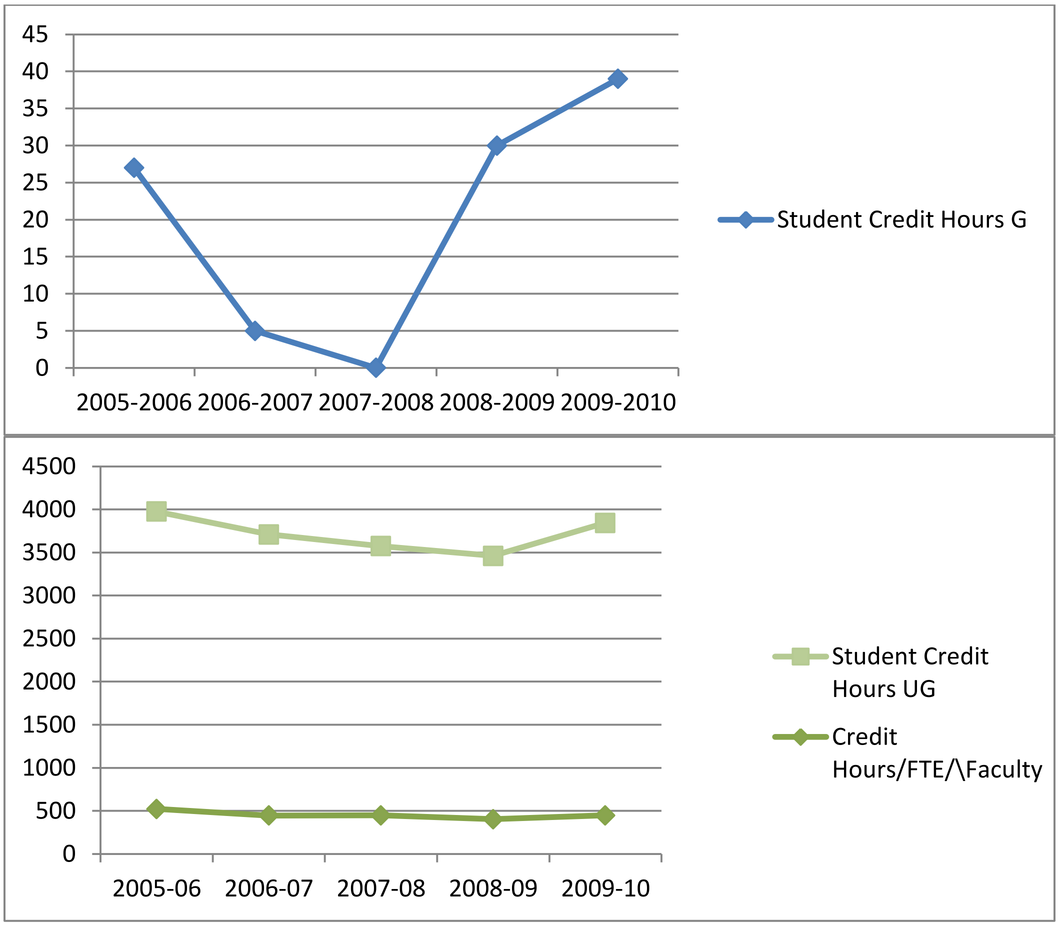
Full-time faculty instruct in lecture and in laboratories. Part-time faculty generally teach laboratories only. An exception was when a retired, former full-time faculty member taught part-time to provide release time to a current full-time faculty member to conduct research. In teaching additional sections of Introductory Earth Sciences courses, there are times when part-time faculty maximize the limit of assigned credit hours and full-time faculty are credited with overloads.

Chart 6
Department Full-time and Part-time Faculty
Fall Semesters 2005-2006 through 2009-2010



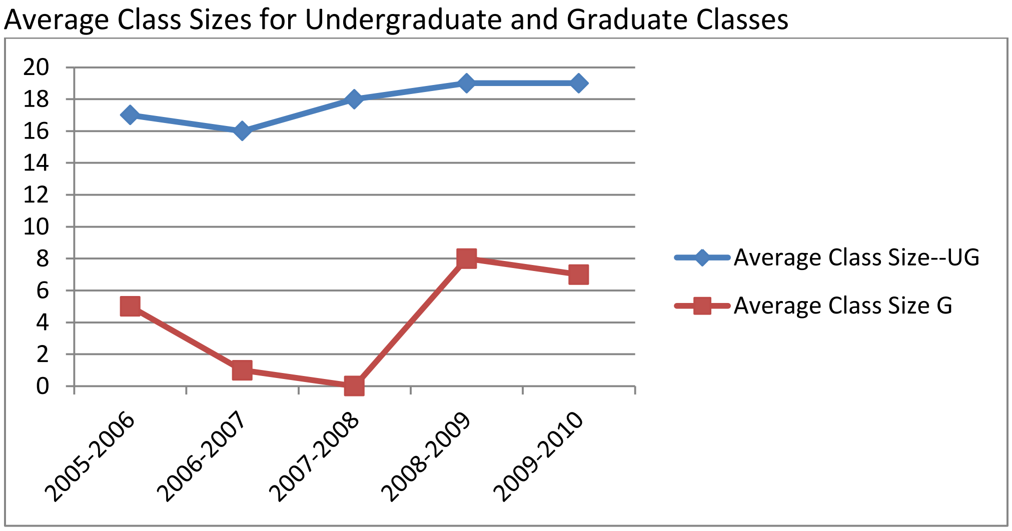
Note the credit hours produced through student enrollment and the Full-Time Equivalency/Faculty presented in Chart 7. Although a decline trended somewhat, the data indicate that perhaps an increase is beginning. The relationship between the undergraduate students' credit hours and the Credit Hours/FTE/Faculty data is apparent. The graduate data are small in comparison and will not reflect this same relationship. Graduate enrollment is climbing as indicated by the 2008-2009 and the 2009-2010 data. This is due, in part, to the integration of graduate courses being offered for elementary, middle school, and high school teachers or education graduate students again.

Chart 7
Students' Credit Hours—Graduate and Undergraduate
and FTE/Faculty
2005-2006 through 2009-2010



Average class sizes are given for undergraduate and graduate classes offered by this department in Chart 8. The data are skewed in that graduate independent studies may have been offered which creates a misconception that classes are smaller than they actually are. This is due to independent studies taught at the graduate level.

Chart 8
Departmental Class Sizes
2005-2006 through 2009-2010



The FTE Student/FTE Faculty Ratio has a five year average of 5.93 and was stable through this period of time. See Chart 9.

Chart 9
FTE Student/FTE Faculty Ratios

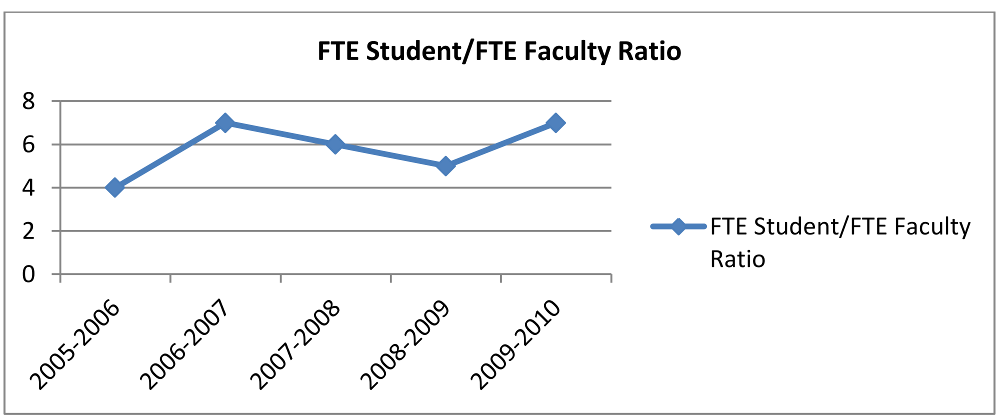
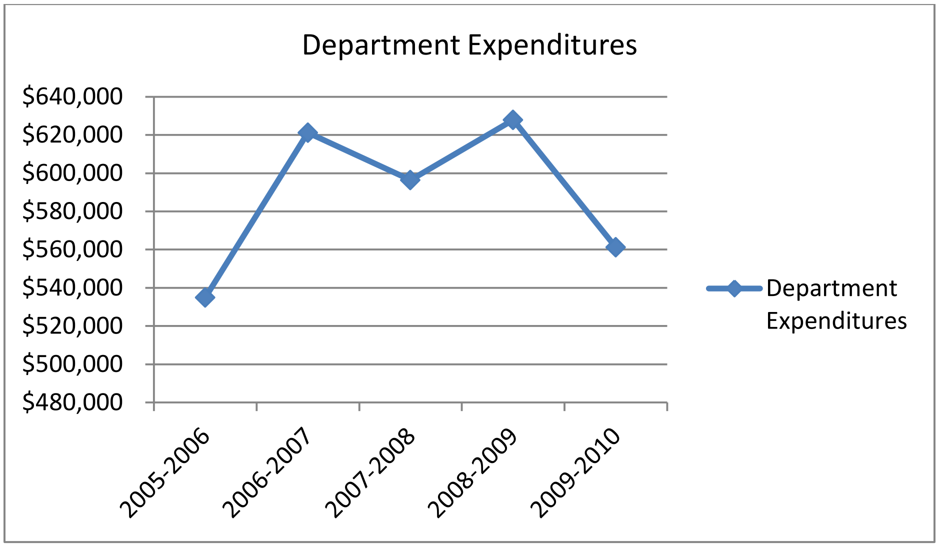


Chart 10 indicates an increase in departmental spending in years 2006-2007; 2007-2008; and 2008-2009. This indicates that monies were available to the university/department prior to another onset of proration beginnings.

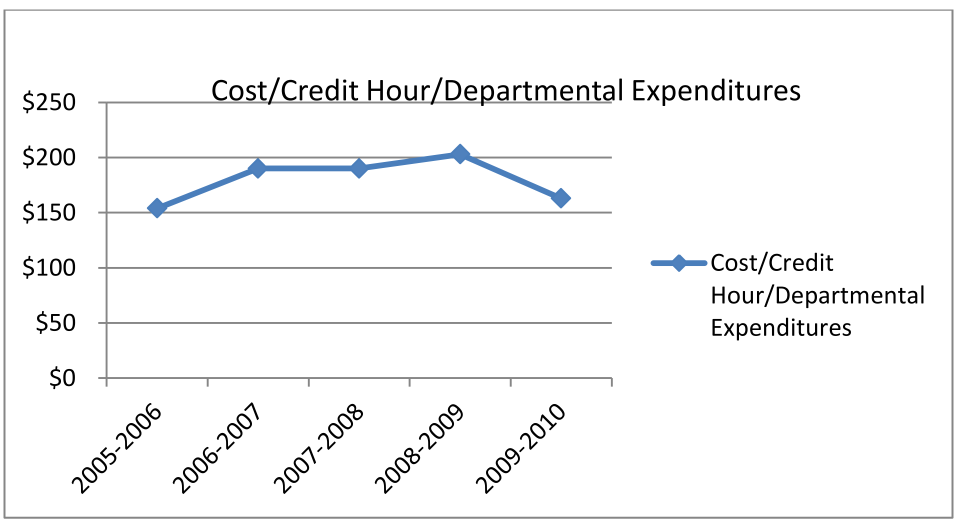
Chart 10
Department Expenditures



Data Source: Office of Institutional Research, Planning, and Assessment

As Chart 11 indicates that credit hour costs generally mirror the department expenditures.

Chart 11
Cost/Credit Hour/Departmental Expenditures



Data Source: Office of Institutional Research, Planning, and Assessment

Other Activities

Activities related to learning included giving attention to students' learning outcomes. A brief description of the identification of those outcomes follows.

2.2 Research Productivity and Professional Engagement (in keeping with the developing promotion Rubric)

Several of the faculty members engage in research as time and monetary resources allow. The type of research in which some engage enhances or limits the publication opportunities.

Dr. Mel Blake publishes on astronomical events and observations.

Blake, R. M. and T. Garber (2010). Gale sources in the Old Open Cluster NGC3680." Presented at the Alabama Academy of Sciences, Jacksonville. (2010).

Ms. Melissa Driskell is completing her Ph. D. and has these publications:

Moore, M. M. E. J. Garnero, T. Lay, and Q Williams (2004). Sher wave splitting and waveform complexity for lowermost mantle structures with low-velocity lamellae and traverse isotropy. *Journal of Geophys*. Res. 109, B02319.

Garner, E. J., Moore, M. M., T. Lay, and M. Fouch (2004). Isotropy or weak vertical transverse isotropy in D" beneath the Atlantic ocean. Journal of Geophys. Research., 109, doi:10.1029/204JB003004, 2004.

Dr. Val Dolmatov has published <u>more than 50 articles</u> in peer-reviewed journals; <u>52 articles</u> in refereed physics books.

Examples are:

Dolmatov, V. K. and S. T. Manson (2010). Interior static polarization effect in A@C60 photoionization (2010). *Physical Review* A 82,023422(1-3).

Dolmatov, V. K. , and S. T. Manson (2006). Photoionization of atoms encapsulated in endohedral iosA@C60^{z}. *Physical Review,* A 73,013201 (1-5).

Dolmatov, V. K. and D. Bailey, and S. T. Manson (2005).Gigantic enhancement of atomic nondipole effects. The 3 3Dresonance in Ca. *Physical Review,* A 72, 022718 (1-5).

Dr. Mark Puckett has published more than 80 articles in peer-reviewed journals.

Examples are:

Puckett, T. M. (2009). On the global distribution of Late Cretaceous ostracodes: The Genus Bicornicythereis (n. gen.) with notes on Curfsina. Micropaleontology, 55, 4, 345-364.

Puckett, T. M. (2008). Ostracodes as indicators of vertebrate environments in the Middle Eocene Guys hill Formation of Jamaica. Micropaleontology, 54, 2, 139-158.

Dr. Richard Statom

Continued incorporation of data into Long-term Spatial Leachate Variations research project
Continued as-reviewer for journal articles

Dr. Brian Thompson publishes on optics research and **presents at professional meetings.**

Examples are:

Separation-sensitive measurements of morphology dependent resonances in coupled florescent microspheres.

Inclusion in a gem beryl var. aquamarine identified using visible light transmission spectroscopy. The 88th meeting of the Alabama Academy of Sciences. Jacksonville.(

Dr. Brenda Webb has presented doctoral research in four professional meetings and as an invited writer for a chapter of a book on sociocultural and political influences on education.

Research—Voices from Inside NCLB: Elementary Science Teaching Professionals. Hawaii International Conference on Education. (2010)

Research—Voices from inside the Classroom: Three Teachers' perspectives on the Impact of NCLB on Elementary Science Education. Center for Qualitative Inquiry. University of Illinois at Urbana-Champagne. (2009)

Most faculty are successful grant writers; all write grants. Recurring grants are achieved by Drs. Thompson and Dolmatov. Dr. Puckett is completing a $180,000 grant for reseach. Dr. Blake recently received two external grants and Ms. Driskell received two internal grants during this five year period.

2.3 Service to Profession, Community, and University

Blake, R. M. develops a monthly newsletter as part of his responsibilities as Director of the Planetarium. This paper is distributed throughout the Shoals community and serves as a great outreach to the community at large. The campus community also receives the newsletter. Dr. Blake also volunteers throughout the community teaching children and adults about stars, planets, etc. He has coordinated astronomy programs with the Music Department and the Art Department.

Melissa Driskell has attended several professional international and national meetings. She is involved in youth development by participating in Science Fairs and making presentations to young students.

Val Dolmatov serves on campus research committees. He is a reviewer for peer refereed journals. Dr. Dolmatov is often invited to present at international conferences.

Mark Puckett presenst paleontological and geological programs to young students in the community. He also participates in university research committees and search committees. He also has presented at international conferences.

Richard Statom serves as a professional consultant in the community for assessment of hydrologic issues. He served a Faculty Senate President and on the Shared Governance Committee. In those capacities he also served in many, many committees to advance the agenda of the faculty, staff, and administration.

Brian Thompson is active as a leader in the Alabama Academy of Science. He served as vice-president, then president, and now as an ex-officio capacity. He has served on several university committees; served as Chair of the Department for one year; and served a chair of a departmental faculty search committee.

Brenda Webb has served as chair of the Strategic planning and Budget Study Committee twice in this 5-year period. She became Department chair; served on numerous university committees including an Alabama Geographic Alliance planning committee for the National Council for Geographic Education Conference—particularly as coordinator for pre-service teacher involvement. She has written and edited more than 40 science and social studies, reading, and math workbooks for grades 3-6.

2.3 Faculty Development

The faculty are involved in developing professionally as they attend conferences and workshop training. Brenda Webb is involved in providing professional development training to pre-service and in-service teachers. Approximately, 86 % of the faculty attended one or more professional meetings during his five-year period.

2.4 Adequate Faculty to Address the Goals and Objectives of Program (OR see below)

As mentioned earlier in this document, it is desirable to create a tenure track position for which Ms. Driskell can apply. She has contributed greatly to the development of teaching and the preparation of documentation. Probably one faculty member, for each of the two programs, should be hired to meet the goals identified for growth in the near future.

2.5 Other

3.0 Assessment of the Department as it Relates to Facilities and Resources to Address the Goals and Objectives of Each Program within the Department

3.1 Laboratory Support

Additional physical space is needed for the physics laboratories along with a better facility in genera—particularly for the laser/optics research; better designed tables for collaboration and working space. Many of these needs are addressed in the plans for the new science building.

The laboratory space in Floyd Science Building for the Earth Sciences is quite inadequate. One laboratory space allows only 18 students for classes/laboratories held there. This limits enrollment. The other laboratory space is over-filled with 18 students. There are only decent lab tables and seats for 16 students. These issues too, primarily are being addressed in the plans for the new science building.

3.2 Instructional Equipment

Most instructional equipment and supplies such as maps, map holders, can be enhanced or upgraded. Perhaps there will be money for updated equipment when the new science building opens. There are many small lab items that need replacement.

3.3 Office and Classroom Space

Storage of geologic materials and other teaching materials in classroom is problematic. Classrooms are over-crowed and the loss of a classroom to biology for the development of a botany lab stressed the classroom space resource. Classroom space is being borrowed a schedule in coordination with the Chemistry department which does not always have space available, These classrooms are located floors away from where geologic materials are located so moving materials that often are heavy and large becomes an issue. Note that we support the Biology

Department and the need for the botany lab space and this comment is not directed at that Department. It is obvious to all who enter Floyd Hall that science departments need a new physical space.

3.4 Educational Technologies

Most computer-related technologies were recently upgraded in science classrooms so that media-based presentations have enhanced quality. Some faculty use clickers to review facts on a regular basis. Most teachers use a diversity of media to support learning and teaching. In the educational program, probes are utilized to take a variety of measurements in the outdoor environment. The department has several Smart Rooms.

3.5 Faculty

The faculty members of the department are collegial and are interested in growing the programs in which they are involved. Six of seven have terminal degrees and the seventh faculty member has achieved most of the requirements for a Ph.D. and continues to progress well. The university has reviewed all faculty credentials to ensure that courses are taught by qualified faculty. All faculty in this department also receive outstanding scores on students responses to semester evaluations. All score 4/5 consistently in their overall assessment.

3.6 Other

4. <u>The Department/ Faculty and /Programs</u>

4.1 <u>Notable Achievements by the Department</u>

Dr. Val Dolmatov received the Bottimore Award.

Two physics students received first place in the presentations of their research at the 88th Academy of Science in student competition. (2009-2010)

4.2 <u>Responses to Previous Program Review Recommendations</u>

The deletion of the Geology major was devastating--particularly to the new faculty who had just accepted teaching positions when this occurred.
It was lost due to Alabama’s articulated viability program guidelines which required graduating seven students from a program in an identified time frame. This greatly reduced the number of students taking the upper level courses. Faculty within this program would really enjoy teaching more upper level courses in addition to the introductory levels.

4.3 <u>Vision and Plans for the Future of the Department</u>

There is discussion among the faculty concerning how to restructure the Earth Science program to attract enough students that a major can be revived.

In addition to the development of a new science building, the Planetarium also should be rebuilt since buildings are likely to surround it according to the 20 year plan indicates growth near the planetarium. Lights in the campus night sky are problematic already

Short and long term planning included a fundraiser which will allow patrons to purchase new chairs for the planetarium. These purchases will buy the chairs, but a certain percentage will be transferred to a scholarship fund. Funds will be available to any major within the Department.

An endowed scholarship fund has become one financial goal to support student attendance at UNA's department of Physics and Earth Science. The department is in the process of coordinating this effort with the UNA Foundation staff.

Program Assessment

Departments should identify expected outcomes for each of their educational programs. The process below helps to determine whether the program achieves the stated outcomes and provides documented evidence of improvement based on analysis of those results. **If a program coordinator exists, the coordinator should complete this part of the report.**

1. Name of Program--Physics

2. Coordinator of Program—Dr. Brian Thompson who provided extensive input to this report.

3. Mission Statement of Program— Students will develop the knowledge and skills to enter graduate schools or the work force and be successful.

4. Program Overview

   The program provides two opportunities to achieve a Bachelor's Degree in Physics or a minor in Physics. A third option is a General Science path to certification in Secondary Education. These students graduate under the umbrella of the College of Education.

4.1 Brief Overview of Program

These are Departmental and Program Goals as Articulated in 2009-2010

A. Adapt Course Offering Schedule; Update Course Titles; Enrich Students; research Experiences
B. Develop an Assessment Plan to Measure Student Learning
C. Secure Scholarships for Majors and Minors
D. Enhance Science Research Equipment: Securing a SEM
E. Build Community Bridges: Planetarium and Observatory
F. Establish Student Scholarship and Social Networks

4.2 Student Learning Outcomes of the program *[Student learning outcomes should identify the broad skill area students should master as a result of the program by the time they graduate. A matrix indicating which courses address each of the outcomes identified may be included]*

Refer to Goals as listed above.

Goal B.. Develop an Assessment Plan to Measure Student Learning

Learning Outcomes

In 2008-2009, the Department faculty began to focus on Student Learning outcomes; they became part of the syllabi. Collectively the common objectives developed by science and mathematics faculty were used initially. As time passed and learning objectives became even a greater focus for assessment and planning, they were tied to university goals. Faculty members continue to work on assessing learning outcomes so that these inform teaching and curriculum. An example of these as they appeared in one syllabus follows.

Area III: Natural Sciences and Mathematics

The Natural Sciences and Mathematics requirement of the General Education Curricula addresses student comprehension of the logic and methods of scientific and mathematical analyses. The Natural Sciences component is designed for students to develop the capacity for working with data, to achieve a general understanding of the nature and methods of science, and to acquire a general knowledge of a specific discipline and the implications of such knowledge.

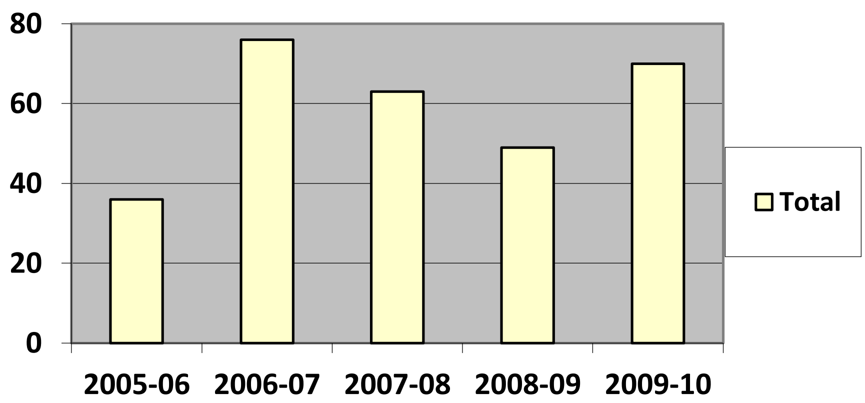
Learning Outcomes related to the University Goals:

Upon completion of General Education courses in the Natural Sciences, students will be able to:

A. *Recognize the logic of scientific methodology for advancing theories within a discipline.*
B. *Demonstrate comprehension of the essential ideas and unifying concepts associated with a discipline.*
C. *Address a scientific question, collect and analyze appropriate data, and interpret the results.*
D. *Understand the dynamic nature of science and its relation to everyday life.*

4.3 Program Productivity—Please refer to pages 4-10 to review charts and narratives concerning may components of the program.
The data involving majors includes many who never make it to graduation. Observations and conversations lead faculty to understand that challenges in mathematics are tremendous factors which often send students to another major. The graduation rates of physics majors are stable at ca. 3-4 per year. The courses offered through the department include lower and upper levels of physics and the teaching methods course. This department's role is heavily advisory in nature. In this context of few, but stable numbers then, there are planned outcomes for growth in the numbers in the major.

The following data indicate declared majors.



4.4 Evaluate the adequacy of library resources available to support your program.

The library provides diverse resources, meaningful assistance, and opportunities to order materials to meet the instructor's and students' needs since each department receives a budget for the library to secure the materials.

4.5 If you deem existing library resources to be inadequate for your program, identify resources that would improve the level of adequacy

No Answer

11.0 <u>Program Evaluation Including Appropriate Documentation</u>

11.1 Means of assessing each Student Learning Outcome

Student learning outcomes typically are assessed as a pretest, a formative assessment, and then again, as a summative assessment. Student progress in achieving learning outcomes is determined and the results are forwarded to the Department Chair at the end of the semester or soon thereafter.

11.2 Summary of the Results of the Assessment/s for Each Student Learning Outcome
11.3 and Appropriate documentation to support the assessment of Student Learning Outcomes as well as the improvements made as a result of these assessments

The following is a quantitative and qualitative reflection, assessment, and plan by a faculty member who taught PH 121. This reflection appears in the Departmental annual report for 2009-2010.

PH 121 Spring 2010

This document is a first attempt to follow the pre-mid-post testing method of assessment advocated by the department for general studies courses taught by the department. As such, the testing structure itself requires assessment.
The questions chosen for pre-mid-post testing represent examples of the learning objectives listed on the last page. Results of questions asked in pre-mid-post testing are shown in the table on that page.

Firstly, let's consider each separate part of the pre-mid-post testing.
The pre-test consists of multiple-choice questions, and it is given during the first lecture. Except for two questions (distinguishing sounds with different pitch and estimating height), I think that most students have essentially no experience with question topics. Although lack of experience and/or misconception is reflected in some topics (for example, question 2 with 26 incorrect responses out of 29), other topics (such as question 18 with only 12 incorrect responses out of 29) suggests a familiarity that students don't actually have. I think this may be due construction issues with the multiple-choice questions themselves. So I will be re-working the

pre-test format, using mostly “short-answer” questions rather than multiple-choice questions.

The mid-test consists of multiple-choice questions given at the beginning of lectures or short-answer questions assigned in homework throughout the semester. What is especially notable here is that the total response rate for these questions is extremely poor. In all cases, only half to two-thirds of the entire class provided responses. When the university discontinuing its mandatory attendance policy, I was no longer comfortable writing a mandatory attendance policy in my syllabus. As a result, absentee rates during the last two semesters have soared, and student response rates to mid-test questions reflect this. This particular detail probably provides me with my strongest challenge for teaching and curriculum. That is, I will be investigating methods to encourage students to attend more lectures without requiring a mandatory attendance policy. Another notable detail about the mid-tests is that I often forgot to record the results. I think the changes I am planning to encourage better attendance rates will also aid me in recording the responses.
The post-test consists of multiple-choice and short-answer questions selected from hour exams. I plan no change of format for these questions.

Secondly, let’s consider the results of the pre-mid-post testing.
For the first three questions, 25%, 90%, and 50% of students answer incorrectly on the pre-test. We see a reduction in incorrect answers on the mid-test, with about 2/3 of the class submitting answers. Then we see that only 10% of students answer incorrectly on the exam. In a perfect world, this is what we’d hope to see throughout the semester… except perhaps a better submission rate for the mid-testing.

Now let’s look at question 6. Essentially, this is the same concept as question 3, except that it requires quantitative calculation rather than qualitative evaluation. We see that 50% of students answer incorrectly on the exam. As shown by question 3, qualitatively they understand what is happening, but as shown by question 6, many struggle with the simplest of algebra problems… solving for an unknown in a straight-line equation (without intercept)

Question 7 is a most interesting case, because it involves a common misconception that can be confronted and addressed by a simple experiment performed at home with a glass, a spoon, and water. I think both the mid-test and the exam question point out exactly how many students tried the experiment at home before submitting answers.

Questions 8 and 9 both require quantitative calculation, solving for an unknown in a straight-line equation (without intercept). The level of algebra required for question 9 is higher than that of question 8, because it requires using scientific notation as well. It seems that those who can handle question 8 can also handle question 9 with its additional mathematics. But as with question 6, a third of the class is not prepared for the algebra required.

From question 13 onward, we can see an abysmal submission rate for mid-testing. We also record large % of incorrect responses on the exam questions. These questions all address fundamental misconceptions of color, mirrors, and lenses. Some of these misconceptions are very stubborn, and so in lectures and labs we confront and address them repeatedly. However, if students are not attending the lectures and labs, then they will fall back upon the misconceptions.

It is my fundamental belief that with a minimum preparation in mathematics, any student can succeed in this course. Some of the questions chosen for pre-mid-post testing demonstrate that not all students entering the course have at least this minimum mathematics preparation. Other questions demonstrate that success is correlated with class attendance. I have no plans for addressing student mathematics preparation. However, as noted above, I will be looking for ways to increase course attendance rates.

11.4 Program improvements made as a result of these assessments

Program improvements came about due to positive attempts at changes in pedagogy or curriculum in individual courses. Attention was given to student learning as it relates to attendance in class. Faculty members continue to grapple with attendance policies.

12.0 Program Recommendations

12.1 Identify recommendations for improvement of the program

To explore the possibility of supporting the expansion of the physics program to support the growth of the Earth Science, e.g., develop and offer a geophysics minor or major to increase the number of majors.

12.2 Recommendations for changes, which are within the control of the program, including curricular changes if appropriate.

During the five year period, several courses were revamped to reflect more current language and to compress as well as extend courses to better allow students to begin early preparation for the senior research project. This plan evolved into the Quality Enhancement Plan for the Department and was an appropriate fir for the QEP theme: Research Literacy. Several ideas were articulated through earlier program goals.

The astronomy faculty member is exploring the possibility of developing an on-line course. Several ideas created a framework for such a course.

12.3 Recommendations for changes that require action at the Dean, Provost, or higher levels to carry out departmental goals, strategies, and projected outcomes are congruent to and support the institution's mission and strategic plan

Addition of minor or major e.g. Geophysics

Program Assessment

Departments should identify expected outcomes for each of their educational programs. The process below helps to determine whether the program achieves the stated outcomes and provides documented evidence of improvement based on analysis of those results. **If a department offers more than one program, each program coordinator should complete this part of the report.**

1. Name of Program—Earth Science –minor

2. Coordinator of Program—Dr. Richard Statom who had input to this report.

3. Mission Statement of Program

To prepare students to utilize their Earth Science background in support of their majors or as a complement to their majors and to help them learn how to connect their studies to real world events,

4. Program Overview

4.1 Brief 0verview of Program

4.2 Student Learning Outcomes of the program *[Student learning outcomes should identify the broad skill area students should master as a result of the program by the time they graduate. A matrix indicating which courses address each of the outcomes identified may be included]*

Refer to Goals as listed above.

Program Goal B. Develop an Assessment Plan to Measure Student Learning

Learning Outcomes

In 2008-2009, the Department faculty began to focus on Student Learning outcomes; they became part of the syllabi. Collectively the common objectives developed by science and mathematics faculty were used initially. As time passed and learning objectives became even a greater focus for assessment and planning, they were tied to university goals. Faculty members continue to work on assessing learning outcomes so that these inform teaching and curriculum. An example of these as they appeared in one syllabus follows.

<u>Area III: Natural Sciences and Mathematics</u>

The Natural Sciences and Mathematics requirement of the General Education Curricula addresses student comprehension of the logic and methods of scientific and mathematical analyses. The Natural Sciences component is designed for students to develop the capacity for working with data, to achieve a general understanding of the nature and methods of science, and to acquire a general knowledge of a specific discipline and the implications of such knowledge.

Learning Outcomes related to the University Goals:

Upon completion of General Education courses in the Natural Sciences, students will be able to:

A. *Recognize the logic of scientific methodology for advancing theories within a discipline.*
B. *Demonstrate comprehension of the essential ideas and unifying concepts associated with a discipline.*
C. *Address a scientific question, collect and analyze appropriate data, and interpret the results.*
D. *Understand the dynamic nature of science and its relation to everyday life.*

4.3 Program productivity to include five-year trends for number of majors, degrees conferred, and other data that demonstrate program growth.

Data have been reported for the Earth Science component although the major no longer exists. It was lost due to Alabama's viability guidelines. A minor still exists. This data is important because the earth Science component of the department plays an important role in general education studies. Thus data that are appropriate are included.

4.4 Evaluate the Adequacy of library Resources Available to Support Your program

The library provides diverse resources, meaningful assistance, and opportunities to order materials to meet the instructor's and students' needs since each department receives a budget for the library to secure the materials.

4.5 If you deem existing library resources to be inadequate for your program, identify resources that would improve the level of adequacy.

No Answer

5.0 Program Evaluation Including Appropriate Documentation

5.1 Means of Assessing each Student Learning Outcome

Student learning outcomes typically are assessed as a pretest, a formative assessment, and then again, as a summative assessment. Student progress in achieving learning outcomes is determined and the results are forwarded to the Department Chair at the end of the semester or soon thereafter.

Summary of the results of the Assessment/s for each Student Learning Outcome This Evaluation Report: ES 121 illustrates tracking of achievement of student learning outcomes. These questions relate to the articulated student learning outcomes. Following the test question, there are the percent (%) of correct responses on a pre-test, a formative test, and a summative test. Scores are listed for Fall and Spring. These questions appeared within other test questions as the semester progressed.

Earth Science 121

TERM:	FALL 2010			SPRING 2011		
NUMBER OF STUDENTS:	49			~62		
	CORRECT (%):			CORRECT (%):		
QUESTIONS: 18	Pre-Test	Mid	Post-Test/	Pre-Test	Mid	Post-Test
A ___________ is a well-tested and widely accepted view that best explains certain scientific observations.	64	56	88	89	85	87
The first step of the scientific method is to ___________.	11	33	38	20	25	33

A ___________ is a well-tested and widely accepted view that best explains certain scientific observations.

a.) hypothesis
b.) generalization
c.) law
d.) theory

The first step of the scientific method is to ___________.

a) Ask a question
b) Construct a hypothesis
c) Observe carefully
d) Formulate a prediction

Deep ocean trenches are superficial evidence for _______.

21 67 69 46 50 66

a.) rifting beneath a continental and the beginning of continental drift.
b.) sinking of oceanic lithosphere into the mantle at a subduction zone.
c.) rising of hot asthenosphere from deep in the mantle.
d.) transform faulting between an oceanic plate and a continental plate.

If you wanted to draw the boundaries of active lithospheric plates on a globe, which of the following maps would give you the most complete information? A map showing:

a) Active volcanoes 15 33 65 42 38 48
b) The global distribution of hot spots
c) The edges of continental shelves
d) Mid-oceanic ridges
e) Earthquake distribution

Which of the following geologic observations would not bear directly on working out the sequence of geologic events in an area?

39 67 69 25 40 83

a.) inclusions of sandstone in a granite pluton
b.) a well-exposed dike of basalt in sandstone
c.) the feldspar and quartz contents of granite
d.) an unconformity between a granite and sandstone

If the half-life of a material x is 1000 years and you found a specimen with equal amounts of material x and material z (the daughter product), the specimen would be about:

a) 2000 years old 14 60 71 20 19 28
b) 1000 years old
c) 500 years old
d) 1500 years old
e) It is not possible to determine from the information given

An ocean upwelling carries 37 73 85 46 50 77

a) Warm water from the central ocean toward the coasts.
b) Cold, nutrient-rich water from the ocean depths to the surface.
c) Warm water from the ocean depths to the surface.
d) Nutrients down to the deep ocean.

The energy that drives surface ocean currents such as the Gulf Stream comes from:

a) Density differences 30 50 75 42 52 86
b) Prevailing winds
c) Salinity variations
d) Wave activity
e) Coriolis force

This process results in the release of about 600 calories of heat per gram of water.

a.) Evaporation
b.) Deposition 18 45 80 22 36 65
c.) Condensation
d.) Melting

Program improvements made as a result of these assessments

Program improvements came about due to positive attempts at changes in pedagogy or curriculum in individual courses. Attention was given to student learning as it relates to attendance in class. Faculty continues to grapple with attendance policies. Assessments in one course convinced one faculty member that using laboratory based activities allowed a more scientific inquiry approach. Student learning prompted the faculty member to continue and expand this approach.

Learning outcomes will be assessed for their quality. Measurements (questions) will be assessed to determine quality/validity.

5.2 Appropriate documentation to support the assessment of Student Learning Outcomes as well as the improvements made as a result of these assessments

<u>See earlier example of questions which relate to assessing comprehension of learning outcomes and three assessment results.</u> Some faculty chose to have students write explanations of concepts.

5.3 <u>Program Recommendations</u>

Develop programs to utilize the Earth Science and other discipline that may be found on the UNA campus

e.g. Geophysics, Geology and the Environment

5.4 Identify recommendations for improvement of the program.

Increased programming will increase students taking upper level courses.
Additional faculty to accommodate growth.

5.4 Recommendations for changes, which are within the control of the program, including curricular changes if appropriate.

Provide professional development on assessments involving critical thinking and engaging students in scientific inquiry.

Engage more in recruiting activities either internally or external to the University.
Determine programs which may integrate other disciplines in other departments on campus.

5.5 Recommendations for changes that require action at the Dean, Provost, or higher levels to carry out departmental goals, strategies, and projected outcomes are congruent to and support the institution's mission and strategic plan

Develop ideas for minors or majors.
Explore summer field excursions throughout the United States. A global approach.
Secure funding to supply the new science building.