1. **AGSC Content Area of Alignment:** Area III: Science and Math

2. **SLO(s) being assessed:** Student will..
   
   SLO 10: Students will understand and appreciate methods and issues of science and technology.

3. **Assessment Method(s):**
   
   [Explain how assessment for the measures associated with this SLO - not grading for the course as a whole - was conducted. You may cut/paste rubrics for inclusion here, identify faculty reviewing committees, or identify specific kinds of test questions important to your method. Is this the method you initially planned to use? Provide a separate paragraph for each method].
   
   See attached report.

4. **Findings: What assessment data did each assessment method produce?**
   
   See attached report.

5. **How did you (or will you) use the findings for improvement?**
   
   [What questions / issues / concerns did your data raise for the faculty teaching the course? What discussion did the faculty have about the findings? What future actions to improve student attainment of this outcome will the department / program take as a result of this analysis?]
   
   See attached report.

6. **Additional Comments:**
   
   [What else would you like the Committee to know about your assessment of this course or plans for the future?]
   
   See attached report.

7. **Committee Comments**
   
   Mean of rubric score= 3.56 (out of 4) Lack of pre-test prevents committee from understanding the attainment of student competency levels
Core Curriculum Assessment Annual Report

General Information

1. Name/Number of Course/Sequence:

Concepts of Science; SCMH 1010

2. SLO(s) being assessed:

SLO 10 – Students will understand and appreciate the methods and issues of science and technology.

3. Department:

SCMH 1010 is an interdisciplinary course in COSAM, which is administered in the Department of Geology and Geography by David T. King, Jr.

4. Department Representative/Contact:

Director for Concepts – David T. King, Jr., Professor of Geology [kingdat@auburn.edu]

5. AGSC Content Area Alignment:

AGSC Alignment Area III – Natural Sciences and Mathematics

Assessment Information

6. Assessment Method(s):

A standard multiple-choice quiz for assessment purposes was developed for the SCMH 1010 course (see description in the progress report of Jan. 2011 for this course). This standard assessment quiz was administered separately by each of the two lecture instructors at or near the end of the fall 2011 and spring 2012 terms and by the sole summer instructor at the end of the 5-week summer term 2012. This quiz was
administered either on a day late in the term when there was good attendance in the class. This quiz was graded for bonus points to encourage attendance. This quiz was given out to all students present on quiz day (no make ups) and all answers were obtained on a standard AU scan form. This is the same assessment quiz and the same method described in the first annual report submitted in October 2011.

On the standard assessment quiz, there are three questions related to a specific example issue or topic in the course that illustrates one of each of the five measures (A-E) that pertain to this class’ SLO. Therefore, there are 15 multiple-choice questions on the assessment exam. Each question has three or four choices, of which only one is correct. The example issues or topics are specifically covered by the general standard syllabus for lecture and laboratories.

The assessment quiz questions address the following measures A-E and specifically the listed examples: (A) the philosophical and historical foundations of a selected aspect of the Concepts of Science course, for example, the philosophical and historical foundation of quantum mechanics; (B) the understanding of the scientific method in a variety of situations, for example, in formulating hypotheses for geological investigations of plate tectonics; (C) the ability to interpret the results of experiments as a way of better understanding natural phenomena, for example, interpreting the evolutionary history of a selected star given data on its luminosity and temperature using a Hertzsprung–Russell diagram; (D) the understanding of major scientific issues facing modern society, including the impact of human activity on the planet, for example, in a question related to the growth of human populations; and (E) the knowledge of basic principles, laws, and theories of modern science, for example, relating the electronic and nuclear structure of an atom to the organization of the periodic table of elements.

In designing the standard assessment quiz questions, both the lecture and laboratory aspects of the course are included. This is appropriate, as pointed out in the preliminary report of Jan. 2011, because lecture and lab are closely aligned in the general standard syllabus for this course.

These are the specific questions asked (answers are not included here) as presented to the students. These questions are divided into the parts noted above:

Part A -- Philosophical and historical foundations of a selected aspect of the Concepts of Science course, for example, the philosophical and historical foundation of quantum mechanics.

1. The first subatomic particle to be identified was the ...

2. The person credited with developing the modern model of the atom in which electrons reside and move within shells was ...

3. When the quantum leap of electrons was understood, this explained the origin of the emission of a packet of energy called a(n) …
Part B -- Understanding of the scientific method in a variety of situations, for example, in formulating hypotheses for geological investigations of plate tectonics.

4. If we wanted to determine the rate (in cm/year) of divergent movement of previously joined tectonic plates, we would have to know the distance of separation of the two plates and the ...

5. A good piece of geographic evidence for fact that eastern South America was once joined with western Africa is the ...

6. The fact that the Pacific tectonic plate is moving over the Hawai’i hot spot is indicated by the ...

Part C -- Ability to interpret the results of experiments as a way of better understanding natural phenomena, for example, interpreting the evolutionary history of a selected star given data on its luminosity and temperature using a Hertzsprung–Russell diagram.

7. On the Hertsprung-Russell diagram above, our Sun plots among the group of stars known as ...

8. On the Hertsprung-Russell diagram above, the younger stars of the main sequence are points that correspond to ...

9. On the Hertsprung-Russell diagram above, the stars called giants (red giants) plot off the main sequence because they are ...

Part D -- Understanding of major scientific issues facing modern society, including the impact of human activity on the planet, for example, in issues related to the growth of human populations.

10. In any ecosystem that includes humans, the type of community member that humans represent is ...

11. Human induced changes in complex, natural ecosystems almost always result in ...

12. On Earth today, the one living group that collectively accounts for more changes in natural systems than any other living group and nearly all natural processes is called ...

Part E -- Knowledge of basic principles, laws, and theories of modern science, for example, relating the electronic and nuclear structure of an atom to the organization of the periodic table of elements.
13. In the periodic table of the elements, the elements that do not combine readily with other elements (i.e., noble elements) are listed on the ...

14. No matter how many shells are filled, in the periodic table of elements, an element that has only one electron in its outer shell will be located in the ...

15. In the ground state, we would expect for an element with six protons to have how many electrons in the second shell?

7. Findings:

The table below shows the average of assessment quiz data (percent correct on each question) that were collected over previous two academic years. Within each academic year average, I have included the data for two fall term sections, one summer term section and two spring term sections. N is the number of students taking the quiz on quiz day for all five sections in that academic year. I am not presenting data by individual section of the course in each term as I have in the past because I do not want scores to be indentified according to instructor. The differences between instructors are likely not significant anyway. Detailed data are on file with the program director.

<table>
<thead>
<tr>
<th>Question number</th>
<th>Pertinent measure under SLO 10*</th>
<th>AY 2010-11 average of all five sections</th>
<th>AY 2011-12 average of all five sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>54.8</td>
<td>55.4</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>69.4</td>
<td>67</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>93.8</td>
<td>95.4</td>
</tr>
<tr>
<td>4</td>
<td>B</td>
<td>67.6</td>
<td>66.8</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>85.8</td>
<td>80.6</td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td>64.2</td>
<td>68.4</td>
</tr>
<tr>
<td>7</td>
<td>C</td>
<td>73.4</td>
<td>74.2</td>
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<td>8</td>
<td>C</td>
<td>58.8</td>
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<td>9</td>
<td>C</td>
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<tr>
<td>15</td>
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<td>60</td>
<td>61.6</td>
</tr>
</tbody>
</table>

*Pertinent measures under SLO 10: (A) the philosophical and historical foundations of a selected aspect of the Concepts of Science course, for example the philosophical and historical foundation of quantum mechanics; (B) the understanding of the scientific method in a variety of situations, for example, in formulating hypotheses for geological investigations of plate tectonics; (C) the ability to interpret the results of experiments as a way of better understanding natural phenomena, for example, interpreting the
evolutionary history of a selected star given data on its luminosity and temperature using a Hertzsprung–Russell diagram; (D) the understanding of major scientific issues facing modern society, including the impact of human activity on the planet, for example, in a question related to the growth of human populations, and (E) the knowledge of basic principles, laws, and theories of modern science, for example, relating the electronic and nuclear structure of an atom to the organization of the periodic table of elements.

As you can see, there is little change in most correct-response averages for each question going from one academic year (AY) to the next. This is remarkable and apparently indicates homogeneity of instruction. Differences of average between questions are likely related to the degree of difficulty of the question.

As a way of comparing AY 2010-11 and AY 2011-12 performance, I made a cross plot of one year versus the other. That graph is presented below (Fig. 1). If the average performance on each question across all five sections each year was different between years being compared, the point representing that question will fall off the correlation line. As you can see, only two points (corresponding to questions 9 and 12) fall any notable distance off the correlation line. It is not clear why these questions resulted in different AY averages. Question 9 (stated above) was lower in AY 2011-12 than AY 2010-11 and question 12 (also stated above) was higher in AY 2011-12 than AY 2010-11.

![Figure 1. AY 2010-11 (vertical axis) versus AY 2011-12 (horizontal axis). Each data point represents one of the 15 quiz questions. Outlying points for questions 9 and 12 are marked.](image-url)
8. How did you (or will you) use the findings for improvement?

The director monitors the assessment and its data and findings. The director shares areas of concern with faculty members who teach this course at the outset of each term and/or at the time that they are recruited to teach the class. The director has shared these data with faculty who have been teaching this course over the past year and has asked for their comments and suggestions for improvement. The director is compiling and considering all those comments. The director goes over these data with his faculty but asks faculty not to ‘teach to the assessment quiz,’ but rather to consider what factors may have affected scores where they are low.

Faculty members who teach this course are volunteers, mainly from within COSAM. Different faculty members teach this course every term. For this reason, the deliberative process regarding these data falls mainly on the director. Since the start of spring term 2011, the director has strongly encouraged faculty to follow a general standard syllabus for the course and he will use the assessment quiz in part to monitor the adherence of instructors to the general standard syllabus. The director feels that if instructors know about the assessment going into the course, this will assist in gaining their compliance with the general suggested syllabus for the course. The director will share data on assessment with future instructors to show them specific measures that are in need of scores. The general standard syllabus is in alignment with the standard assessment quiz described above. An effect of using this assessment may also be that instructors more closely adhere to the agreed standard syllabus, which is a benefit for the students (considering the fact that this class articulates with other science courses and we do not know what second science a student may take at Auburn).

The director alone controls the laboratory part of the class each term and therefore can address issues regarding results as they pertain to the laboratory part of the class (lab is 25% of the whole course; not a separate grade).

9. Additional Comments:

The director will continue to monitor the results of these assessment quizzes to determine what future action is required. Unless a more detailed statistical analysis is required in the future, none is planned at this time. The director will retain individual instructor’s results, but will not present them in these reports unless asked to do so by the Provost’s office.

If the students were randomly guessing, the percent correct would be about 33%. No bin is anywhere near this low, so that suggests to the director that there is learning and retention occurring across all course material. Also, the students are taking the quiz seriously (probably the result of potential bonus points attached to the quiz by the instructors in each instance). The director feels that if the bonus point aspect is removed, participation and the quality of data will suffer. One has to take into account that many of the students in this course are “low end” with respect to scientific background and interest in learning about science. Therefore, they need an inducement
to perform in the course, a fact noted by the director many times over in his 32 years teaching experience at Auburn.

Note: For AY 2011-12, a correction was made regarding an error in wording of choices in question 9 (as given during AY 2010-12). Otherwise, no changes were made in the assessment quiz for AY 2011-12. No changes are planned for the standard assessment quiz going forward unless there is a reason to do so. The assessment quiz papers are retained and thus are not going out with students (where they could otherwise end up on test files, etc.).

10. CCGEC Comments: