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

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

4. **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].
   Please see report that is attached.

5. **Findings: What assessment data did each assessment method produce?**
   Numerical data from assessment quizzes given to students. See report attached.

   **Attachment name:** Core Curriculum Assessment Annual Report - SCMH

6. **Based on the comprehensive rubric for the appropriate SLO(s), indicate the extent of competency of the average student who has completed this core course in each learning outcome assigned to it:**

<table>
<thead>
<tr>
<th>SLO</th>
<th>Level of Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLO 10</td>
<td>intermediate</td>
</tr>
</tbody>
</table>

7. **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?]

   As pointed out in the attached report for AY 2012-13 regarding Concepts of Science (SCMH 1010), the following measures under SLO 10 need additional work to move from what the director and others involved in the course determined to be a “basic” level of performance to a higher level.>Philosophical and historical foundations of a selected aspect of the Concepts of Science course, for example, the philosophical and historical foundation of quantum mechanics.>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. During the coming academic year, the director will work directly with lecture instructors and laboratory teachers (GTAs) to increase students’ understanding these areas. Ways of improvement may include additional time spent on these topics, additional assignments in lecture or lab, or additional experiences for students like videos.

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

9. **Committee Comments:**
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. 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 or at the final exam. This quiz was graded for bonus points to encourage attendance and participation. This quiz was given out to all students present on quiz day (no make ups or early quizzes) and all answers were obtained on a standard AU scan form. This is essentially the same assessment quiz and the same method described in the first annual report submitted in October 2011 (see previously submitted descriptions of this approved instrument).

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 previous reports, 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 Hertzsprung-Russell diagram above, our Sun plots among the group of stars known as ...

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

9. On the Hertzsprung-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 (Table 1) 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 identified 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 5 sections (N = 371)</th>
<th>AY 2011-12 average of all 5 sections (N = 682)</th>
<th>AY 2012-13 average of all 5 sections (N = 754)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>54.8</td>
<td>55.4</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>69.4</td>
<td>67</td>
<td>58.6</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>93.8</td>
<td>95.4</td>
<td>90.8</td>
</tr>
<tr>
<td>4</td>
<td>B</td>
<td>67.6</td>
<td>66.8</td>
<td>64.6</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>85.8</td>
<td>80.6</td>
<td>77.8</td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td>64.2</td>
<td>68.4</td>
<td>69.6</td>
</tr>
<tr>
<td>7</td>
<td>C</td>
<td>73.4</td>
<td>74.2</td>
<td>79</td>
</tr>
<tr>
<td>8</td>
<td>C</td>
<td>58.8</td>
<td>60.8</td>
<td>58.8</td>
</tr>
<tr>
<td>9</td>
<td>C</td>
<td>76.8</td>
<td>62.2</td>
<td>69.8</td>
</tr>
<tr>
<td>10</td>
<td>D</td>
<td>97.6</td>
<td>97.8</td>
<td>94.8</td>
</tr>
<tr>
<td>11</td>
<td>D</td>
<td>95.2</td>
<td>95.4</td>
<td>93</td>
</tr>
<tr>
<td>12</td>
<td>D</td>
<td>70.6</td>
<td>80.8</td>
<td>77.4</td>
</tr>
<tr>
<td>13</td>
<td>E</td>
<td>85.6</td>
<td>81.6</td>
<td>77.8</td>
</tr>
<tr>
<td>14</td>
<td>E</td>
<td>91.4</td>
<td>89</td>
<td>87.2</td>
</tr>
<tr>
<td>15</td>
<td>E</td>
<td>60</td>
<td>61.6</td>
<td>57.2</td>
</tr>
</tbody>
</table>

Table 1. Concepts of Science’s AY average of assessment quiz performance data per question (see relation of questions to SLO measures given above). N is the number of student participants.

*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 mainly to the degree of difficulty of the question. As a way of visually comparing performance across three academic years, I made a bar graph to display results (Figure 1). It seems unlikely to the director that there would be a statistically significant difference between performances from one AY to the next.

![Figure 1. Bar graph showing % correct for each question (#1-15 on horizontal axis) within each AY (blue = 2010-11; orange = 2011-12; yellow = 2012-13). The vertical axis is total % correct for three years.](image)

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 (lecture instructors) who teach this course, both 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 instructors who have been teaching this course over the past three years and has asked for their comments and suggestions for
improvement. The director compiles and considers all instructors’ comments. The director goes over these data with his lecture instructors but asks instructors 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 quiz 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 directs and 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; the laboratory is not a separately numbered course).

9. Additional Comments:

The director will continue to monitor the results of these assessment quizzes to determine what future action is required. The director will retain individual instructor’s results, but will not present them in these reports by name 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 33 years teaching experience at Auburn.

Note 1: 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 compelling reason to do so. The
assessment quiz papers are retained (then destroyed) and thus are not going out with students (where they could otherwise end up on test files, etc.).

Note 2: For AY 2012-13, it was requested that the director provide an additional analysis “based on the comprehensive rubric for the appropriate SLO(s), (to) indicate the extent of competency of the average student who has completed this core course in each learning outcome assigned to it.” In order to do this, the percent correct for the previously described groups of three questions per SLO measure were averaged to obtain one value representing the individual SLO measure. A grading scale was then applied to those five single values (referred to from this point on as “SLO 10’s measure values”). The grading scale was developed in collaboration with the graduate teaching assistants who are in close working contact with Concepts of Science students. In this grading scale, A = advanced; B = intermediate; C = basic; D = little/none. These terms, e.g., “advanced,” correspond directly to the SLO 10’s rubric categories currently posted on-line by the AU Provost’s office. For an A (“advanced”), it was agreed that the SLO 10’s measure values should be in the range of 100-85%. And for a B, the SLO 10’s measure values should be in the range of 84-70%; a C 69-55%; and a D 54-40%. Table 2 (below) shows the results for AY 2012-13.

<table>
<thead>
<tr>
<th>Question numbers in the SLO measure group</th>
<th>SLO 10’s measure values (as defined above)</th>
<th>Letter grade using scale noted above</th>
<th>Verbal term according to agreed rubric for SLO 10</th>
<th>Director’s review of each SLO measure group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, and 3</td>
<td>65.8</td>
<td>C</td>
<td>basic</td>
<td>agree/needs work</td>
</tr>
<tr>
<td>4, 5, and 6</td>
<td>70.7</td>
<td>B‐</td>
<td>intermediate</td>
<td>agree</td>
</tr>
<tr>
<td>7, 8, and 9</td>
<td>69.2</td>
<td>C+</td>
<td>basic</td>
<td>agree/needs work</td>
</tr>
<tr>
<td>10, 11, and 12</td>
<td>88.4</td>
<td>A</td>
<td>advanced</td>
<td>agree</td>
</tr>
<tr>
<td>13, 14, and 15</td>
<td>74.1</td>
<td>B</td>
<td>intermediate</td>
<td>agree</td>
</tr>
</tbody>
</table>

Table 2. Additional analysis of SLO 10’s measure values for AY 2012-13.

Regarding the first group of questions (#1-3), the measure addressed is *Philosophical and historical foundations of a selected aspect of the Concepts of Science course, for example, the philosophical and historical foundation of quantum mechanics.* A “basic” level of knowledge shows there is room for overall improvement in this area and this will be addressed in the coming academic year.

Regarding the second group of questions (#4-6), the measure addressed is *Understanding of the scientific method in a variety of situations, for example, in formulating hypotheses for geological investigations of plate tectonics.* An “intermediate” level of knowledge shows there is some room for overall improvement in this area and this will be addressed in the coming academic year.

Regarding the third group of questions (#7-9), the measure addressed is *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.* A “basic”
level of knowledge shows there is room for overall improvement in this area and this will be addressed in the coming academic year.

Regarding the fourth group of questions (#10-12), the measure addressed is *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.* An “advanced” level of knowledge shows that this is the high point in the sustained level of understanding by Concepts of Science students over time and across instructor’s sections. In the coming academic year, we will sustain this performance.

Regarding the fifth group of questions (#12-15), the measure addressed is *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.* An “intermediate” level of knowledge shows there is some room for overall improvement in this area and this will be addressed in the coming academic year.

For the purposes of reporting just one “level of ability” for the whole course and across all of SLO 10’s measures, I suggest that intermediate (on the lower end of the definition of that term) is appropriate at this time.

10. CCGEC Comments: