

ACADEMIC ASSESSMENT
CHEMISTRY UNIT
ACADEMIC YEAR 2017-2018

COMPILED BY

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WITH INDIVIDUAL COURSE CONTRIBUTIONS FROM THE
RESPECTIVE INSTRUCTORS FROM CHEMISTRY UNIT



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Institutional Mission Statement: Alabama Agricultural and Mechanical University reflects the uniqueness of the traditional land-grant institution combining teaching, research, service, liberal arts, and vocational fields. The university offers baccalaureate, masters and doctoral level degrees to all qualified and capable individuals who are interested in further developing their technical, scientific, professional, a and scholastic skills.

Program Purpose: The mission of the Chemistry Unit can be expressed as a commitment to 1) excellence in education and to the provision of a scholarly environment in which inquiring and discriminating minds may be nourished. 2) Provide a broad foundation in chemistry to prepare students for continuation of their education either through graduate studies or professional school or for effective participation in local and national arenas. 3) The unit aims to provide directions and assistance with regards to their program of education so the students may comprehend and apply the discipline of learning, thinking, and problem solving which has been cumulatively developed in the study of physical sciences. 4) Encourage the search for new knowledge through research and its applications in a commitment to the development of its students to their highest potential through innovative and quality programs of instruction, challenging undergraduate research and establishment of co-operative programs with local industries, universities, and other agencies interest in the development and training of our students.

Student learning outcomes for BS degree in Chemistry: **Upon Completion of the Bachelor of Science degree program in Chemistry students will:**

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| <ol style="list-style-type: none"> 1. The student will demonstrate firm foundations in the fundamentals and application of current chemical and scientific theories. 2. The student will develop skills in problem solving, critical thinking and analytical reasoning. 3. Students will exhibit the ability to design, carry out, record and analyze the results of chemical experiments. 4. Students will demonstrate the ability to communicate effectively the result of their work to chemists and non-chemists. | |
| (Assessment Measures – Quantitative) 1a | 1a. Senior Research Project – A comprehensive rubric is used to grade the Senior Research Projects. At least 70% of students completing the Senior Research Project will earn a score of 80 (B) or above. |
| | The comprehensive rubric covers subject content, originality of work, explanation of results, usefulness of research in advancement of science and current events overall presentation, questions/answers and scientific manuscript. |
| Assessment Expected results | 1a. Senior Research Project - Students were assessed based on their Senior Research Project. |
| | 60% of the students earned a score of 80 (B) or above.[total for both semesters. [Can you fill in the numbers) |
| | 1a. Senior Research Project – The Chemistry faculty assessed the results obtained from the Senior Research Project and is in continuous process of improving the research experience assuring that the chemical experiments are indeed challenging and useful to the scientific chemical world. We have modified the syllabus to include scientific literature review and how to write a scientific manuscript |
| Assessment measure 1b | 1b. Graduate Placement – A comprehensive report of the successfulness of the graduates to pursue graduate school or to find a job in the student's chosen field of study.). |
| | |
| Assessment Results- Expected | At least 50% of students completing the Chemistry program will find employment opportunities in their field or pursue graduate studies in the area of Chemistry or some type of professional studies (i.e., law, medicine, pharmacy |
| Assessment Results | 1b. Graduate Placement - Graduates were assessed based on their successfulness to pursue graduate studies, |

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| | professional studies or their ability to find a job in their respected field of study. From the 2016-2017 graduating class there were 12 successful graduates. Out of the 6, 50% is attempting to pursue graduate studies, M.S. or Ph.D. program, 20%, professional school (pharmacy). [Odutola fill in the nubers] |
| | 1b. Graduate Placement – The Chemistry faculty assessed the results obtained from the graduate placement and realized that it is imperative that Chemistry continues to build partnerships and relationships with various industries, graduate schools and professional schools. The Chemistry Unit will enhance partnerships and cooperative agreements in order to increase the number of students being placed in positions |
| Exit Exam | 1c. Chemistry Exit Exam – Chemistry utilized the Educational Testing Systems standardized exam for the Chemistry as the AAMU Chemistry Exit Exam. This exam was given during the semester in which the student graduated. At least 50% of our students will score within the 25% percentile when compared nationally. The exit exam covered materials from all areas of chemistry including General Chemistry, Analytical/Qualitative Chemistry, Organic Chemistry, Physical Chemistry, Inorganic Chemistry and Biochemistry. |
| Assessment External | 1c. Chemistry Exit Exam - The 4 graduates were assessed based on the Educational Testing System exam for Chemistry. |
| Assessment Results | The total scores for the exam range from 126 – 140. The students were tested in the areas of Physical Chemistry, Organic Chemistry, Inorganic Chemistry and Analytical Chemistry. 1c. |
| Use of results | 1c. Chemistry Exit Exam – To improve student performance and improve the assessment measure of their overall performance, the proposed plan was to generate an Exit Exam and give to our graduating seniors. After further evaluation of the exam and its results, the Chemistry faculty has taken a look at its current curriculum in order to make sure that all imperative topics are being covered. In addition, an Exit Exam review has been generated |
| | |

Below are the results of the Individual courses of different instructors and their SLOs and Program outcomes specific to their courses, which include the General Education courses which almost all science students have to take; Organic Chemistry course taken by Biology, Chemistry, Food and Environmental Science students; followed by courses only taken by chemistry Majors .

GENERAL CHEMISTRY COURSES:
CHE 101, CHE 101L, AND CHE 102 , CHE 102L
DR. K. BHAT, DR. J. KIM AND DR. P. OKWEYE

| Student Learning Outcome 1- Analyze | |
|---|--|
| Outcome 1: Assessment Measure 1- Concept learning-Discuss | |
| Class: | General Chemistry 101 , CHE 102 |
| Course Mode: | Face-to-Face |
| Assignment: | Problem solving for measuring concept learning |
| Evaluation Tool: | Multiple choice questions ,in class timed exam. |
| Performance Target: | Atleast 50% of students must clear the minimum with in the allocated time |
| Results: | 68.00% |
| Use of Results: | Class average is 52.0% this is in Fall 2017. In Spring 2018 to 64% |
| Outcome 1: Assessment Measure 2- Concept learning - Apply | |
| Class: | General Chemistry 101, 102 |
| Course Mode: | Online |
| Assignment: | Multi media assignments, word problems end of chapter and questions to measure mastery of concepts |
| Evaluation Tool: | Limited attempts to solve, and grade placement based on algorithms |
| Performance Target: | All students must complete the assignments within the time frame of the semester. One third the number of assignments must be completed by the students before midterm |
| Results: | Many students not completed the assignments due to so mid term grades are not very good. However by the end of the semester performance improves to large extent |
| Use of Results: | if students complete the assignments in a timely fashion better in class results are observed as seen by by the performance over the semesters. |

| Student Learning Outcome 2 Interpret | |
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| Outcome 2: Assessment Measure Perform experiments | |
| Class: | Laboratory class |
| Course Mode: | Face-to-Face |
| Assignment: | Perform experiments in the labs and demonstrate experiments Solve a problem in class, determine the reaction type by studying the nature of the product |
| Evaluation Tool: | Results from experiment and classification designated by students |
| Performance Target: | Grade range between 80-100; 80% of the class must acquire |
| Results: | |
| Use of Results: | To improve the student 's ability to classify chemical reactions by developing skills to identify using different |
| Outcome 2: Assessment Measure 2- Understand , evaluate observation and obtain conclusions | |
| Class: | Laboratory class |
| Course Mode: | Face-to-Face |
| Assignment: | Perform heat exchange experiment |
| Evaluation Tool: | Obtain results using concept learnt in the lecture to determine the direction of movement of energy and be able to explain their results. Accuracy as compared to standard values |
| Performance Target: | Atleast 50% of class within experimental range of 10-15% error |
| Results: | 45.35% overall students are able to perform |
| Use of Results: | Increase the percentage by about 5% next semester, By providing more practical on site demonstrations in clas swith lecture. Greater student participation |

| Outcome 3: Assessment Measure Conversion | |
|---|--|
| Class: | |
| Course Mode: | Face-to-Face |
| Assignment: | Problem solving in class after going through the steps for application |
| Evaluation Tool: | Exam on line and homework assignments on line, using multi - media tools, tutorial and visualization experiments |
| Performance Target: | 60% of the class should be able to answer the problems |
| Results: | 67.73% on an average are available to solve a variety of such problems |
| Use of Results: | Improve and ensure that more students work out problems in class. Improve by 5% and monitor for next semester |
| Outcome 3: Assessment Measure :Understand | |
| Class: | General Chemistry 101, 102 |
| Course Mode: | Face-to-Face |
| Assignment: | Integrated rate equations, 1st order, second order zero order, to distinguish characteristics of the reaction, multimedia, tutorial, online exam with limited attempt, Mastery |
| Evaluation Tool: | Exam in class, quiz , online grade |
| Performance Target: | 60% must pass subject content |
| Results: | overall 60.49% |
| Use of Results: | After one semester grades 77%, and also preparation for upper level classes. |

| Program Outcome 1 Ability to discuss concepts and analyze results | |
|---|---|
| Assessment Measure: | Multimedia problems, demonstration experiments, hands on experiments |
| Assessment Target: | Solving and reasoning out results to obtain conclusions |
| Assessment Results: | 68 percent through online assignments; overall for class 52.00 % |
| Use of Results: | Provide more hands on problems for solving. 2 encouraging students to use TAN service for better clarification and retention of concepts. Improvement from Fall 2017 to Spring 2018 currently 77%- 85% General Education chemistry course |
| Program Outcome D Understand concepts | |
| Assessment Measure: | Exams, in class, online restricted access to help, and homework |
| Assessment Target: | 65% of students |
| Assessment Results: | Changes observed on monitoring students from Fall 2017-2018. Improvement seen 78% to 82% |
| Use of Results: | An attempt will be made to further ensure that weak concept analysis and application are improved in the next semester by about 5%. |

As per last year, again, it was decided to compare the teaching techniques and practices and student learning outcomes by comparing the scores based on (a) Bloom's cognitive Taxonomy. The highlights for each area of teaching has been presented based on the instructor's evaluation. However, in case of General Chemistry many instructors do teach and hence a composite preview of their assessment is presented with commonalities included for analysis are shown below:

This year a systematic evaluation of the effectiveness of the General chemistry education common courses has been subjected to Grade Analytics to determine the areas for improvement based on (i) Bloom's cognitive taxonomy. Bloom's cognitive taxonomy measures 5 attributes: namely (i) Ability to analyze; (ii) Ability to apply learned information/knowledge; (iii) Evaluate the information provided; (iv) Remember concepts and (v) Exhibit the understanding of the concepts. The Blooms Cognitive Taxonomy results are shown in Figure 1 and 2 as shown below:

COMPARISON OF ASSESSMENTS FOR 4 SEMESTERS – 2016-2018 GENERAL CHEMISTRY

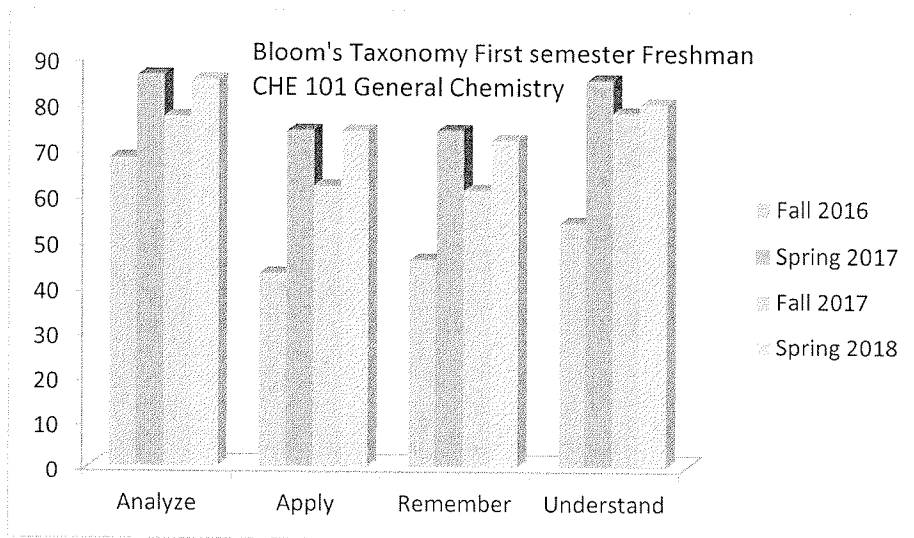


Figure 1. Bloom taxonomy evaluation for CHE 101

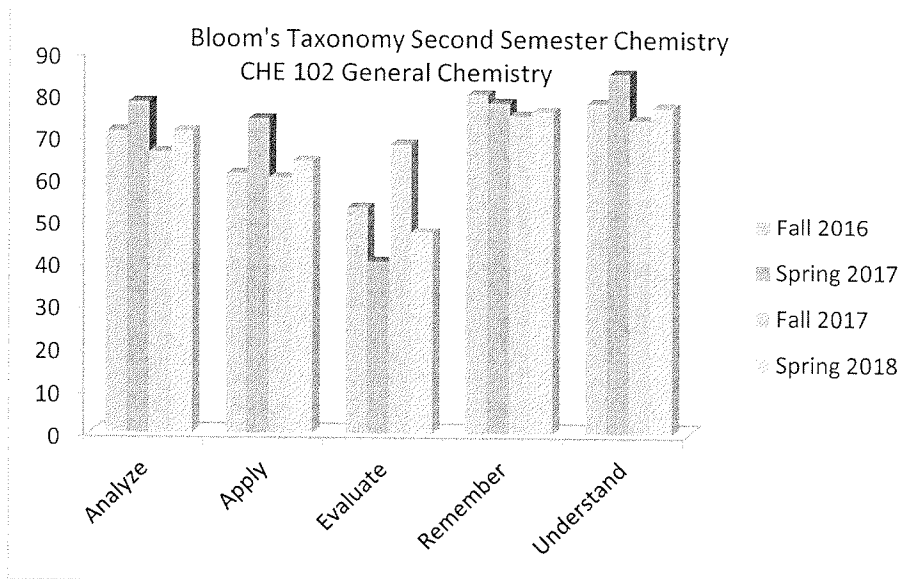


Figure 2. Bloom taxonomy evaluation for CHE 102

From the above plots it is seen that the use of online homework and in-class exams with tutorial quick help appears to improve student performance. It has to be remembered that in class some students coming in from well supported schools already have some knowledge of chemistry and so are able to perform better than the rest but even non chemistry students show improvement once they put in effort. The students are not the same continuing students from one class in General Chemistry 101 and follow through with instructors in second semester with the same instructor, but a mix and hence the overall performance does indicate that all general chemistry faculty are on par in their teaching and communicating (i) main concepts in chemistry; (ii) able to inculcate the application of chemical principles; (iii) are able to make students understand and retain the main chemical concepts in chemistry; (iv) and evaluate the chemical application of chemical principles when working hands on in the laboratory.

ASSESSMENT FOR ORGANIC CHEMISTRY CHE 251 AND CHE 251L-
DR.K. JOHNSON

| Student Learning Outcome 1 | |
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| groups present in the structure of an organic molecule. - Give the correct IUPAC and common names of an organic compound when provided the structure and give the correct structure of a compound when | |
| Outcome 1: Assessment Measure 1 | |
| Class: | Organic Chemistry I, CHE-251-01 |
| Course Mode: | Face-to-Face |
| Assignment: | helps the student master the subject area and an End of Chapter assignment that further helps the students comprehend each chapter. Additionally, students are given worksheets with worded problems |
| Evaluation Tool: | In class timed exams that constitute multiple choice and short answer questions. Students are given limited attempts on the multimedia assignments. |
| Performance Target: | Atleast 90% of the students to pass the class |
| Results: | 70% |
| Use of Results: | Class average is 80% for Fall 2018. 80% for Spring 2018. Students generally do relatively well on outcome 1. However, to increase to the class average more questions were given for assignments. |
| Outcome 1: Assessment Measure 2 | |
| Class: | |
| Course Mode: | |
| Assignment: | |
| Evaluation Tool: | |
| Performance Target: | |
| Results: | |
| Use of Results: | |

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| Student Learning Outcome 2 | |
| of organic compounds, including: substitution, addition, elimination, oxidation-reduction and free radical reactions and the mechanisms for these reactions.- Predict the product(s) of an organic reaction(s) | |
| Outcome 2: Assessment Measure 1 | |
| Class: | Organic Chemistry I, CHE-251-01 |
| Course Mode: | Face-to-Face |
| Assignment: | helps the student master the subject area and an End of Chapter assignment that further helps the students comprehend each chapter. Additionally, students are given worksheets with worded problems |
| Evaluation Tool: | In class timed exams that constitute multiple choice and short answer questions. Students are given limited attempts on the multimedia assignments. |
| Performance Target: | Atleast 90% of the students to pass the class |
| Results: | 70% |
| Use of Results: | Class average is 74% for Fall 2018. 67% for Spring 2018. Increase the percentage by about 5% next semester. Students will be given more assignments on these topic areas. Also this is the latter half of the semester and students stop attending classes hence the decrease in average from outcome 1. Students are compelled to |
| Outcome 2: Assessment Measure 2 | |
| Class: | |
| Course Mode: | |
| Assignment: | |
| Evaluation Tool: | |
| Performance Target: | |
| Results: | |
| Use of Results: | |

| Student Learning Outcome 3 | |
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| Outcome 2. To participate in interdisciplinary learning through the opportunity to apply analytical techniques learned in the chemistry courses to upper level courses in other disciplines. | |
| Outcome 3: Assessment Measure 1 | |
| Class: | Organic Chemistry Lab I, 251L-01 |
| Course Mode: | Face-to-Face |
| Assignment: | comprehension of the details of the lab. Lab reports are written for each lab after the lab is completed. Students are also required to complete post-lab questions. |
| Evaluation Tool: | Students are given a rubric that is used to grade their lab report. The post lab questions are graded using an answer key. |
| Performance Target: | Atleast 95% of the students to pass the class |
| Results: | 88.00% |
| Use of Results: | Class average is 85% for Fall 2018. 90% for Spring 2018. |
| Outcome 3: Assessment Measure 2 | |
| Class: | |
| Course Mode: | |
| Assignment: | |
| Evaluation Tool: | |
| Performance Target: | |
| Results: | |
| Use of Results: | |

| Program Outcome 1 | |
|---|--|
| Students should master the concept of Organic Chemistry and apply their knowledge to problem solving. | |
| Assessment Measure: | multimedia assignments, hands on experiments and worksheets |
| Assessment Target: | Assess students command of the subject area and their ability to apply their knowledge to solving assigned problems. |
| Assessment Results: | Class average for fall 2017 75% .Class average for Spring 2018 is 81% |
| Use of Results: | Students were given more assignment questions in the mastery section of the mutilmedia homework. They were also encoraged to come to my office for tutoring and to utilize the TAN service so as to better understand the course material. |
| Program Outcome 2 | |
| Create and Remember | |
| Assessment Measure: | multimedia assignments, hands on experiments and worksheets |
| Assessment Target: | To asses students ability to create reaction schemes from minimal information and their remembrance of the course material. |
| Assessment Results: | Fall 2017 class average 68% and 74% for spring 2018 |
| Use of Results: | Students will be given more practice in an effort to increase their retention of the course material and improve class average by 5% next semester. |

ASSESSMENT FOR ORGANIC CHEMISTRY CHE 252 AND CHE 252L

DR. A. ELKHALDY

| Program Outcome 1 | |
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| Assessment Measure: | |
| Assessment Target: | |
| Assessment Results: | |
| Use of Results: | |
| Program Outcome 2 | |
| Assessment Measure: | |
| Assessment Target: | |
| Assessment Results: | |
| Use of Results: | |

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| Student Learning Outcome 1 | |
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| Outcome 1: Assessment Measure 1 | |
| Class: | |
| Course Mode: | |
| Assignment: | |
| Evaluation Tool: | |
| Performance Target: | |
| Results: | |
| Use of Results: | |
| Outcome 1: Assessment Measure 2 | |
| Class: | |
| Course Mode: | |
| Assignment: | |
| Evaluation Tool: | |
| Performance Target: | |
| Results: | |
| Use of Results: | |