Detailed Assessment Report

As of: 5/08/2015 04:02 PM EDT

2012-2013 Chemistry BA & BS

(Includes those Action Plans with Budget Amounts marked One-Time, Recurring, No Request.)

Mission / Purpose

The Bachelor of Science degree in Chemistry is designed to provide students with the background needed for science-related industrial and academic positions, for entry into chemistry graduate programs or professional programs (for example: such as medicine, veterinary medicine, dentistry, optometry) and, coupled with the appropriate education courses, to prepare students to teach high school chemistry. The mission is consistent with the IU Kokomo Mission Statement.

Goals

G 1:understanding of the theoretical basis of chemistry

Goal I: Knowledge and understanding of the theoretical basis of chemistry.

Goal II Laboratory Work and Performance
Goal III: Application of Quantitative Reasoning Skills and Critical Thinking to Problem Solving

G 2:Laboratory Work and Performance

Laboratory Work and Performance

G 3:Application of Quantitative Reasoning Skills and Critical Thinking to Problem Solving

Application of Quantitative Reasoning Skills and Critical Thinking to Problem Solving

Student Learning Outcomes/Components, with Any Associations and Related Artifacts/Objects, Benchmarks, Findings, and Action Plans

S 1:Students will be able to connect observations with prior information/comp#1

Goal I: Knowledge and understanding of the theoretical basis of chemistry.

Outcome 1: Students will be able to connect observations with prior information

Components:

1. Prediction of chemical reaction products

3. Explanation of the significance and/or validity of the results.

Goal II: Laboratory Work and Performance

Outcome 1: Students will demonstrate the understanding and ability to carry out laboratory procedures effectively and safely.

Components:

1. Explanation of the purpose of the steps in a laboratory procedure.

2. Use of standard laboratory equipment and instrumentation properly and safely.

Outcome 2: Students will collect, analyze, and draw relevant conclusions from experimental data.

Components:

1. Collection and organization of relevant data.

2. Analyze experimental data appropriately.

3. Interpretation of processed data.

4. Identification of experimental errors.

Outcome 3: Design procedures appropriate to the goal of an investigation.

Components:

1. Selection of a suitable experimental approach.

2. Modification of the approach to optimize the experimental outcome.

Goal III: Application of Quantitative Reasoning Skills and Critical Thinking to Problem Solving

Outcome 1: Students will learn to organize relevant information for analysis.

Components:

1. Identification of critical data elements necessary to understand the problem

2. Identification of applicable theories and/or mathematical relationships

Outcome 2: Students will calculate quantitative values and/or formulate an explanation of observations.

Components:

1. Application of theories to illustrate how observations can be understood

2. Application of equations to determine mathematical values with appropriate significant figures and units

Outcome 3: Students will draw conclusions from quantitative values and/or experimental observations.

Component:

1. Correlation of quantitative results to chemical and/or physical properties of systems.

3. Interpretation of processed data.

4. Identification of experimental errors.

Outcome 3: Design procedures appropriate to the goal of an investigation.

Components:

1. Selection of a suitable experimental approach.

2. Modification of the approach to optimize the experimental outcome.

Goal III: Application of Quantitative Reasoning Skills and Critical Thinking to Problem Solving

Outcome 1: Students will learn to organize relevant information for analysis.

Components:

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Outcome 2: Students will calculate quantitative values and/or formulate an explanation of observations.

Components:

1. Application of theories to illustrate how observations can be understood

2. Application of equations to determine mathematical values with appropriate significant figures and units

Outcome 3: Students will draw conclusions from quantitative values and/or experimental observations.

Component:

1. Correlation of quantitative results to chemical and/or physical properties of systems.

Outcome 1:

Students will demonstrate the understanding and ability to carry out laboratory procedures effectively and safely.

Components:

1. Explanation of the purpose of the steps in a laboratory procedure.

2. Use of standard laboratory equipment and instrumentation properly and safely.

Outcome 2: Students will collect, analyze, and draw relevant conclusions from experimental data.

Components:

1. Collection and organization of relevant data.

2. Analyze experimental data appropriately.

Related Artifacts/Objects:

A 1:pre and post quiz before and after explaination
We ask student question about suggested reaction and test their knowledge about prediction of the reaction product , then I explain the subject and ask same question again

Source of Evidence: Faculty pre-test / post-test of knowledge mastery

Benchmark:
We expect 70% of the students to be able to predict the reaction product after explanation.

A 2:course tests
in course tests

Source of Evidence: Academic direct measure of learning - other

Benchmark:
60% got three out of 4 question correct

A 4:Survay for chemsitry courses (lectures
1- for 100 Level courses (C105/C106) 68% of students meet the bench mark for goal 1 and 3 (outcome 1 with component 1 and 2)
2- For 300 level courses only 47% of the students meet the bench mark (C310 75% while C342 only 20%) for goal 1, while for goal 3 (C310 85% while C342 only 20%)

For the very low out come in C342 (organic chemistry, the low achievement percentage requires more emphasis on fundamental physical /organic concepts and focusing on smaller set of reactions

Source of Evidence: Academic direct measure of learning - other

A 5:Survay for chemsitry courses (lectures
We used faculty developed tests , with more concentration of the data from the final comprehensive tests. We surveyed two level of courses , first is 100 level courses . We combined data for C105 and C106 to judge the outcome one of goal 1 and goal 3 . Second we surveyed 300 level courses that offered once a year (C310 -analytical chemistry and C342 Organic chemistry I)

Source of Evidence: Academic direct measure of learning - other

Benchmark:
We set bench mark of 70 % of student to achieve this mark .for either goals i or 3 (outcome 1 -

Findings (2012-2013) - Benchmark: Partially Met

Goal 1, outcome 1 (two component)
1- for 100 Level courses (C105/C106) 68% of students meet the bench mark for goal 1 (outcome 1 with component 1
2- For 300 level courses only 47% of the students meet the bench mark (C310 75% while C342 only 20%) for goal 1,

Goal 3 , outcome 1

1- for 100 Level courses (C105/C106) 68% of students meet the bench mark for goal 3 (outcome 1 with component 1
2- For 300 level courses only 47% of the students meet the bench mark (C310 85% while C342 only 20%) for goal 3,

For the very low out come in C342 (organic chemistry, the low achievement percentage requires more emphasis on fundamental physical /organic concepts and focusing on smaller set of reactions

S 2:Students will be able to connect observations with prior information/cop#2

outcome 1: Students will be able to connect observations with prior information Comp#2 . Identification of chemical reaction products

Related Artifacts/Objects:

A 1:pre and post quiz before and after explaination

We ask student question about suggested reaction and test their knowledge about prediction of the reaction product , then I explain the subject and ask same question again

Source of Evidence: Faculty pre-test / post-test of knowledge mastery

Benchmark:

We expect that also 75% of the student will be able to achieve the recognition of reaction product/s

A 2:course tests

in course tests

Source of Evidence: Academic direct measure of learning - other

Benchmark:

70 % of the students were be able to answer three out of 4 questions correctly

A 4:Survay for chemsitry courses (lectures

1- for 100 Level courses (C105/C106) 68% of students meet the bench mark for goal 1 and 3 (outcome 1 with component 1 and 2)
2- For 300 level courses only 47% of the students meet the bench mark (C310 75% while C342 only 20%) for goal 1, while for goal 3 (C310 85% while C342 only 20%)

For the very low out come in C342 (organic chemistry, the low achievement percentage requires more emphasis on fundamental physical /organic concepts and focusing on smaller set of reactions

Source of Evidence: Academic direct measure of learning - other

A 5:Survay for chemsitry courses (lectures

We used faculty developed tests , with more concentration of the data from the final comprehensive tests. We surveyed two level of courses , first is 100 level courses . We combined data for C105 and C106 to judge the outcome one of goal

1 and goal 3 . Second we surveyed 300 level courses that offered once a year (C310 -analytical chemistry and C342 Organic chemistry I)

Source of Evidence: Academic direct measure of learning - other

S 3:Students will be able to explain the physical and chemical properties of substances /comp#1

outcome 2: Students will be able to explain the physical and chemical properties of substances based on an understanding of atomic and molecular structure.
comp#1 :1. Explanation of physical properties

S 4:Students will be able to explain the physical and chemical properties of substances /comp#2

outcome #2 : Students will be able to explain the physical and chemical properties of substances
comp#2 : Explanation of chemical properties

S 5:Students will perform quantitative calculations using experimental data./comp#1

Outcome #3 : Students will perform quantitative calculations using experimental data.
comp #1 : Selection of an appropriate theoretical relationship/equation for data analysis

S 6:Students will perform quantitative calculations using experimental data/comp#2

outcome #3 : Students will perform quantitative calculations using experimental data
compo#2: Completion of quantitative calculations 3. Explanation of the significance and/or validity of the results

S 7:Students will perform quantitative calculations using experimental data/comp #3

outcome # 3: **Students will perform quantitative calculations using experimental data**
comp #3: Explanation of the significance and/or validity of the results.

S 8:Students will demonstrate the understanding and ability to carry out laboratory procedures effectively and safely/comp#1

Outcome 1: Students will demonstrate the understanding and ability to carry out laboratory procedures effectively and safely.

Components:1. Explanation of the purpose of the steps in a laboratory procedure.

Related Artifacts/Objects:

A 6:Survay for laboratory work

Students participated in lab work associate with chemistry courses at 300 level. We used student performance in C311 (Instrumental analysis lab, and C344 organic chemsitry I lab) tp set a bench mark for our finding.

Source of Evidence: Performance (recital, exhibit, science project)

Benchmark:
we set 70% as a bench mark for goal II

Findings (2012-2013) - Benchmark: Met

Generally, the students learned and performed well the experimental procedures for their labs and became familiar with the appropriate analytical instruments including electrochemical analyzer . chromatographic equipments a 90 MHz NMR spectrometer, an IR spectrometer, and a gas chromatography column. The grades of all five of the chem/biochem majors surpassed the 70% benchmark for the course.

S 9:Students will demonstrate the understanding and ability to carry out laboratory procedures effectively and safely/comp#2

Outcome 1: Students will demonstrate the understanding and ability to carry out laboratory procedures effectively and safely.
Components 2: . Use of standard laboratory equipment and instrumentation properly and safely.

S 10:Students will collect, analyze, and draw relevant conclusions from experimental data/comp#1

Outcome 2: Students will collect, analyze, and draw relevant conclusions from experimental data..
Components:1. Collection and organization of relevant data.

S 11:Students will collect, analyze, and draw relevant conclusions from experimental data/comp#2

Outcome 2: Students will collect, analyze, and draw relevant conclusions from experimental data.

Components:2. Analyze experimental data appropriately.

S 12:Students will collect, analyze, and draw relevant conclusions from experimental data/comp#3

Outcome 2: Students will collect, analyze, and draw relevant conclusions from experimental data.

Components:3. Interpretation of processed data.

S 13:Students will collect, analyze, and draw relevant conclusions from experimental data/comp#4

Outcome 2: Students will collect, analyze, and draw relevant conclusions from experimental data.

Components:4. Identification of experimental errors.

S 14:Design procedures appropriate to the goal of an investigation/comp#1

Outcome 3: Design procedures appropriate to the goal of an investigation.
Components:1. Selection of a suitable experimental approach.

S 15:Design procedures appropriate to the goal of an investigation./comp#2

Outcome 3: Design procedures appropriate to the goal of an investigation.
Components:2. Modification of the approach to optimize the experimental outcome.

S 16:Students will learn to organize relevant information for analysis./comp#1

Outcome 1: Students will learn to organize relevant information for analysis.
Components1. Identification of critical data elements necessary to understand the problem

S 17:Students will learn to organize relevant information for analysis./comp#2

Outcome 1: Students will learn to organize relevant information for analysis.
Components:2. Identification of applicable theories and/or mathematical relationships

S 18:Students will calculate quantitative values and/or formulate an explanation of observations/comp#1

Outcome 2: Students will calculate quantitative values and/or formulate an explanation of observations.
Components1. Application of theories to illustrate how observations can be understood

Related Artifacts/Objects:

A 3:class test
questions about stoichiometry and balancing chemical equations

Source of Evidence: Academic direct measure of learning - other

Benchmark:
70% of the students

Findings (2012-2013) - Benchmark: Met
3 out of 4 chemistry majors achieved this component for this outcome.for C105 and also for c106

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

continue same assesment for next year
Established in Cycle: 2012-2013
we intend to continue with the same goals and outcomes to collect more data . this is because of the small number of chemistry s...

S 19:Students will calculate quantitative values and/or formulate an explanation of observations/comp#2

Outcome 2: Students will calculate quantitative values and/or formulate an explanation of observations.

Components:2. Application of equations to determine mathematical values with appropriate significant figures and units

Related Artifacts/Objects:

A 3:class test
questions about stoichiometry and balancing chemical equations

Source of Evidence: Academic direct measure of learning - other

Benchmark:
70% of students

Findings (2012-2013) - Benchmark: Met
3 out of 4 chemistry majors achieved this component for this outcome.for C105 and also for c106

Related Action Plans (by Established cycle, then alpha):

For full information, see the *Details of Action Plans* section of this report.

continue same assesment for next year
Established in Cycle: 2012-2013
we intend to continue with the same goals and outcomes to collect more data . this is because of the small number of chemistry s...

S 20:Students will draw conclusions from quantitative values and/or experimental observations/comp#1

Outcome 3: Students will draw conclusions from quantitative values and/or experimental observations.
Component1. Correlation of quantitative results to chemical and/or physical properties of systems.

Details of Action Plans for This Cycle (by Established cycle, then alpha)

continue same assesment for next year
we intend to continue with the same goals and outcomes to collect more data . this is because of the small number of chemistry student involved in the assessment.. We think that combining two or three years of data may give us more realistic analysis and conclusion for these goals and outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: High

Relationships (Artifact/Object | Outcomes/Components):
Artifact/Object: class test | **Outcomes/Components:** Students will calculate quantitative values and/or formulate an explanation of observations/comp#2

Responsible Person/Group: chemistry faculty teaching first year major courses

continue same assesment for next year
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Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: High

Relationships (Artifact/Object | Outcomes/Components):
Artifact/Object: class test | **Outcomes/Components:** Students will calculate quantitative values and/or formulate an explanation of observations/comp#1

Responsible Person/Group: Chemistry faculty who teach the first year major course.

Analysis Questions and Analysis Answers

What did you learn about your students' learning from the assessment process in the most recent year?

Chemistry student learn and become more focused if they are within diverse background population of students. In 2012/2013 with 11 chem. with benchmark partially met, we suggested that we use one more year focusing on these goals within outcome 1 in order to collect more data. Although the collected data are very encouraging, the low number of chemistry students assessed in this year is not enough to derive a realistic conclusion.

How widely and frequently have these results been discussed with your program faculty?

We have a new method of assessment, newly established degrees in chemistry, and two newly hired faculty (that makes a chemistry division with only 3 faculty). We have had two meeting with recently-hired faculty to establish and expand sources of information about achieving of these goals and outcomes from new courses.

What do these results mean for your program?

With consideration about collecting more data for the coming year, we nevertheless consider the current data to be promising for our program growth and effectiveness. Results seem to indicate that our students are developing adequate skills for solving basic general chemistry problems. For higher level chemistry courses, there needs for further development and more focus.

What are your next steps going forward?

We will focus on one outcome for each of these goals for two more years to gather more information (due to the low number of chemistry students involved in this assessment). We expect an increase in chemistry students enrollment in the coming years. We will take the necessarily steps and actions that ensure that we meet and maintain the benchmark of 70 % .

Annual Report Section Responses

[SAMPLE] Highlights

The topic of the third exam in C105 is stoichiometry. Our goal was to have students score at least 70 out of 100 points on this exam. Four chemistry and chemistry/biochemistry majors earned an average score on exam 2 of 76 in 2012, and four chemistry and chemistry/biochemistry majors earned an average of 73 in 2013. We realizes that this small number of chemistry students does not justify any conclusion

this year. We will analyze an accumulative numbers for two more years along with this year to derive a reasonable analysis