

Annual Assessment Report

Physical Science Minor

Dr. Vern Hart

Annual Assessment Report

Program Profile

| | 2013-2014 | 2014-2015 |
|-------------------|-----------|-----------|
| Minors | 12 | 12 |
| Full Time Faculty | 3 | 3 |
| Part Time Faculty | 1 | 1 |

Combine all major students. If your discipline has a **secondary education certification component**, you will need to indicate that in the title of this report unless you are submitting a separate report for the education component.

*If your discipline is a major with **one or multiple concentrations**, that information needs to be included as separate content. Report the number of declared students by concentration and each concentration will need a separate assessment section.

Program Delivery (HLC 3A3)

Traditional on-campus X

Online Program

Evening Cohort

Analysis:

The physical science minor program has the following retention goals for the upcoming academic year:

1. At least 75% of students who declare the minor will finish the program prior to graduation.
2. At least 10 students will declare the physical science minor each year.

It is also anticipated that this program will not increase the time to degree for students in other major programs. Students who declare a physical science minor will be expected to graduate within the

standard four-year period which is planned for most students. Any physical science minors requiring additional time will be evaluated on an individual basis to determine whether the program contributed to the need for additional semesters of study. If this is found to be the case, further assessment will be conducted.

Outside Accreditation:

There are currently no plans for outside accreditation for this program as it was recently revised significantly. Once the program has completed multiple academic cycles in its current form, this option will be explored further.

Program Action Items

| | |
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| Action Item 1: | Consistently achieve an enrollment of at least 4 students in either CHM 300 or SCI 300 (independent study) each year. The course involves original research and is offered as a tutorial. |
| Action steps: | The courses will be advertised in the introductory science (PHY/CHM) sequence in order to inform students of potential investigation topics and opportunities for conducting independent research. |
| Timeline | The 2014-2015 and 2015-2016 school years. |
| Faculty Responsible | Dr. Vern Hart |
| Evaluation | At the conclusion of the 2014-2015 school year, one student had completed the SCI 300 course. Four students have enrolled in the course for the fall of 2015. Enrollment in the course will be evaluated further after the spring of 2016. |

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| Action Item 2: | Produce at least 3 physical science minors per year during the first two years of the revised program. This will help to ensure that the program remains a viable option for students who are interested in the degree. |
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| Action steps: | Students will be informed of the possibility for receiving a physical science minor. They will also be invited to participate in ongoing research projects. |
| Timeline | The 2014-2015 and 2015-2016 school years (2 graduation cycles). |
| Faculty Responsible | Dr. Vern Hart |
| Evaluation | The number of declared minors will be tracked and assessed after this period. The program was recently revised and has yet to be completed by a student in its current form. |

Program Objectives: (from most recent Assessment Plan)

1. Students will develop a functional understanding of the physical sciences and the fundamental laws governing the world around them.
2. Students will obtain familiarity with the scientific method and the processes involved in proposing and answering an original research question.
3. Students will improve their mathematical skills and learn to develop and interpret accurate models predicting the behavior of complex systems.
4. Students will acquire an appreciation for the seminal discoveries and technological advances resulting from scientific theories.

Program Objectives Matrix (from most recent Assessment Plan)

| | Objective 1 | Objective 2 | Objective 3 | Objective 4 |
|--------------------|-------------|-------------|-------------|-------------|
| PHY 201 | I | | I | I |
| PHY 202 | | I | | |
| CHM 114 | R | | R | R |
| CHM 115 | | R | | |
| SCI 230 | R | | R | |
| PHY 212 CHM 124 | A | | A | |
| PHY 213 CHM 125 | | R,A | | A |
| SCI 300 | | M | | |

I=Introduced

R= Reinforced

M=Mastered

A=Assessed

All objectives will be assessed either yearly or as articulated on a cycle. Objectives are not necessarily assessed each time they are listed as a program objective for the course. The faculty in the program determine when the objective will be assessed, in which course, with which artifact, and what if any outside assessment will occur.

Assessment of Program Objectives

| | |
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| Objective 1 | Students will develop a functional understanding of the physical sciences and the fundamental laws governing the world around them. |
| Methods | Mastering Physics homework assignments in PHY 201 Chemistry homework assignments in CHM 114 |
| Benchmark | An average overall homework score of 85% on mastering physics Every chemistry homework assignment completed with a passing grade |
| Data Collected (course specific) | Overall homework scores were collected from 20 students in the PHY 201 course and averaged. The mean homework score was 83.8% (see attached spreadsheet). Not every CHM 114 assignment was completed by every student enrolled in the course. |
| Data Collected (Assessment Day) | Minor programs do not currently participate in assessment day. |
| Results/Outcomes | The homework benchmark was deficient by 1.2%. When outliers (i.e. uncompleted assignments) were removed from the data samples, these benchmarks were achieved. |
| Proposed changes to the assessment process | Further investigation indicates that several low homework scores (< 50%) decreased the overall course average. The removal of all failing grades produced a mean of 91.5% (see spreadsheet). This suggests that one of the following modifications be implemented. Either the benchmark be lowered or modified to state that only a certain percentage of the class needs to meet the benchmark. It is suggested that in the coming course rotation, the homework benchmark should require 85% of the class to achieve an overall homework score of 85%. Similarly, it is suggested that 85% of students in the chemistry courses complete all assignments with a |

| | |
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| | passing grade. |
| Budget needs related to the objective? | None |

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| Objective 2 | Students will obtain familiarity with the scientific method and the processes involved in proposing and answering an original research question. |
| Methods | Lab reports assigned weekly during PHY 202 or CHM 115 The original research topic investigated during CHM/PHY 300 |
| Benchmark | An average score of 8/10 on all PHY or CHM lab reports Successful completion of an original research project during CHM/PHY 300 (SCI 300) |
| Data Collected (course specific) | Lab report scores were collected from all 20 students enrolled in the PHY 202 course. The average lab report score was 99.8%. The PHY 300 course was completed by one student during the spring of 2015. This student was able to present the results of original research at the annual meeting of the Missouri Academy of Science. |
| Data Collected (Assessment Day) | Minor programs do not currently participate in assessment day. |
| Results/Outcomes | The benchmark was successfully achieved. |
| Proposed changes to the assessment process | The current benchmark for lab report grades is too low and needs to be raised to reflect the standards of the course. |
| Budget needs related to the objective? | None |

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| Objective3 | Students will improve their mathematical skills and learn to develop and interpret accurate models predicting the behavior of complex systems. |
| Methods | Lab reports assigned weekly during PHY 213 or CHM 125 Homework essay questions assigned in PHY 212 |
| Benchmark | An average score of 8/10 on all PHY 213 or CHM 125 lab reports An average homework score of 85% in PHY 212 |
| Data Collected (course specific) | Lab and homework scores were collected from 12 students enrolled in PHY 212 in the spring of 2015 (see attached spreadsheet). |
| Data Collected (Assessment Day) | Minor programs do not currently participate in assessment day. |
| Results/Outcomes | Each student attended every lab session and completed the lab report. As a result, the average lab score was 100%. The average homework score for the course was 77.04% (8% below the benchmark). When failing homework scores were removed from the data set, this average rose to 85.5%, meeting the benchmark. |
| Proposed changes to the assessment process | The current benchmark for lab report grades is too low and needs to be raised to reflect the standards of the course. It is suggested that in the coming course rotation, the homework benchmark should require 85% of the class to achieve an overall homework score of 85%. |
| Budget needs related to the objective? | None |

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| Objective 4 | Students will acquire an appreciation for the seminal discoveries and technological advances resulting from scientific theories. |
| Methods | Lectures given during PHY 201, CHM 114, and SCI 230 The student-designed-experiment assigned at the conclusion of PHY 213 |
| Benchmark | Consistent attendance in all lecture courses (>85%) An average score of 8/10 on the student designed experiment assignment |
| Data Collected (course specific) | Attendance data was collected for all 20 students in PHY 201. The average rate of attendance was 99.22%. The average lab score in PHY 213 was 100% with each student successfully completing every lab report. |
| Data Collected (Assessment Day) | Minor programs do not currently participate in assessment day. |
| Results/Outcomes | The benchmark was successfully achieved. |
| Proposed changes to the assessment process | The current benchmark for attendance and lab completion is too low and needs to be raised to reflect the standards of the course. |
| Budget needs related to the objective? | None |

Analysis of Assessment:

The benchmarks for attendance and lab reports are too low. Students often work together (as a lab group) in completing their lab reports, resulting in high grades. These scores may not be adequately suited for assessment purposes and alternative benchmarks may need to be identified.

Analysis of the Assessment Process (Empirical & Non-Empirical) (HLC4B3)

Coursework data is collected using owl.net. Scores are exported to an excel spreadsheet and averages are calculated for specific course categories (i.e. homework, labs, exams, etc.) This process worked well for PHY 201/212 but did not work well for PHY 202/213 as mentioned above.

Program Changes Based on Assessment:

This program was recently revised significantly and has yet to be completed in its current form. As a result, previous assessment plans are not available for review and changes cannot be recommended at this time.

General Education Assessment:

PHY 201, 202, 212, and 213 as well as CHM 114, 115, 124, and 125 satisfy general education requirements for the Natural Sciences. General Education objectives are included in the assessment of individual courses.

Program Activities:

Student Performance Day Activities (Assessment Day):

Minor programs do not currently participate in assessment day.

Senior Achievement Day Presentations:

Minor programs do not currently participate in senior achievement day.

Service Learning Activities:

Several students involved in this program participated in the science demo team during the fall and spring semesters. This organization travels to local elementary schools and conducts science shows for grade school students. The students benefit from learning to present and explain the scientific principles included with each demonstration. The community benefits from attendance at these events.

Program Sponsored LEAD Events:

During the fall and spring semesters, a poster session LEAD event was sponsored to facilitate student presentations on the history of scientific discovery. This event allowed students to organize and present information to a group of their peers, in line with general education objectives. It is also congruent with program objective 4 (developing an appreciation of technologies stemming from scientific discoveries).

A student enrolled in the SCI 300 course presented the results of original research at a LEAD event during the spring semester.

Student Accomplishments:

Three students in the program secured summer internships and one student presented a paper at a regional conference.

Faculty Accomplishments:

- Presented optical scattering research at the annual meeting of the Missouri Academy of Science.
- Published a paper on spheroidal wave function modeling in the Journal of Applied Optics.
- Presented research on deformable image registration at the annual AAPM meeting in Indianapolis.
- Presented a poster on high-frequency ultrasound at the annual AAPM meeting.
- Coauthored a presentation on pancreatic cancer diagnosis at AAPM meeting.
- Coauthored a poster on Positron Emission Tomography (PET) imaging at AAPM meeting.
- Presented research on sparse tomographic methods at the 2014 APS fall meeting.
- Presented research on biophotonic scattering at the 2013 APS fall meeting.

Alumni (Recent Graduates) Accomplishments (past year graduating class):

This program was recently revised and has yet to be completed by a student in its current form.

Objective 1

| PHY 201 | | | | | | | | |
|--------------|------------|----------------|----------------|-----|--|-----------------|---|--|
| Student Info | | | Homework | | | | | |
| Name | | | Type Grade | | | | | |
| ID | Last Name | First Name | % | Let | | | | |
| 236735 | Baker | Rebecca | 53.82 | F | | | F | |
| 218219 | Behlmann | Stephanie | 99.99 | A | | 99.99 | A | |
| 208502 | Berlin | Victoria | 91.76 | A | | 91.76 | A | |
| 247820 | Bexten | Brittany | 100.55 | A | | 100.55 | A | |
| 217325 | Bivin | Jessica | 82.9 | B | | 82.9 | B | |
| 232689 | Briles | Ashley | 65.35 | D | | 65.35 | D | |
| 212485 | Cooper | Megan | 104.45 | A | | 104.45 | A | |
| 247858 | Fritz | Grace | 97.13 | A | | 97.13 | A | |
| 204874 | Helle | Matthew | 56.63 | F | | | F | |
| 209038 | Lancashire | Kayla | 76.63 | C | | 76.63 | C | |
| 233006 | McKee | Miranda | 100.09 | A | | 100.09 | A | |
| 234441 | McNamara | Jordan | 99.08 | A | | 99.08 | A | |
| 215466 | O'Connell | Cassandra | 74.36 | C | | 74.36 | C | |
| 230358 | Peters | Hallie | 96.37 | A | | 96.37 | A | |
| 231973 | Riebkes | Hannah | 65.58 | D | | 65.58 | D | |
| 237655 | Rizi | Sophia | 10.45 | F | | | F | |
| 217212 | Ryan | Joan | 103.62 | A | | 103.62 | A | |
| 235840 | Schmidt | Ryan | 105.63 | A | | 105.63 | A | |
| 253464 | Yuengel | Ryan | 102.97 | A | | 102.97 | A | |
| 213453 | Zink | Bryn | 88.97 | B | | 88.97 | B | |
| 253914 | Hart | Vern | | | | | | |
| | | | | | | | | |
| | | AVERAGE | 83.8165 | | | 91.49588 | | |

Objective 2

| Student Info | | | Lab Report | |
|--------------|------------|------------|------------|-------|
| Name | | | Type | Grade |
| ID | Last Name | First Name | % | Let |
| 236735 | Baker | Rebecca | 100 | A |
| 218219 | Behlmann | Stephanie | 100 | A |
| 208502 | Berlin | Victoria | 100 | A |
| 247820 | Bexten | Brittany | 100 | A |
| 217325 | Bivin | Jessica | 100 | A |
| 232689 | Briles | Ashley | 100 | A |
| 212485 | Cooper | Megan | 100 | A |
| 247858 | Fritz | Grace | 100 | A |
| 204874 | Helle | Matthew | 98.33 | A |
| 209038 | Lancashire | Kayla | 100 | A |
| 233006 | McKee | Miranda | 100 | A |
| 234441 | McNamara | Jordan | 100 | A |
| 215466 | O'Connell | Cassandra | 97.5 | A |
| 230358 | Peters | Hallie | 100 | A |
| 231973 | Riebkes | Hannah | 100 | A |
| 237655 | Rizi | Sophia | 100 | A |
| 217212 | Ryan | Joan | 100 | A |
| 235840 | Schmidt | Ryan | 100 | A |
| 253464 | Yuengel | Ryan | 100 | A |
| 213453 | Zink | Bryn | 100 | A |
| 253914 | Hart | Vern | | |
| | | | | |
| | | AVERAGE | 99.792 | |

Objective 3

| PHY 212 - Spring 2015 | | | | | | | | | |
|-----------------------|------------|------------|------------|--------|--|----------|--------|--------|--|
| Student Info | | | Type Grade | | | | | | |
| Name | | | Homework | | | | | | |
| ID | Last Name | First Name | % | Letter | | | % | Letter | |
| 208502 | Berlin | Victoria | 94.53 | A | | | 94.53 | A | |
| 217325 | Bivin | Jessica | 75.71 | C | | | 75.71 | C | |
| 232689 | Briles | Ashley | 73.43 | C | | | 73.43 | C | |
| 212485 | Cooper | Megan | 96.1 | A | | | 96.1 | A | |
| 209038 | Lancashire | Kayla | 71.43 | C | | | 71.43 | C | |
| 234441 | McNamara | Jordan | 96.5 | A | | | 96.5 | A | |
| 211241 | Reece | Jessica | 32.5 | F | | | | | |
| 231973 | Riebkes | Hannah | 64.65 | D | | | 64.65 | D | |
| 237655 | Rizi | Sophia | 36.55 | F | | | | | |
| 217212 | Ryan | Joan | 97.05 | A | | | 97.05 | A | |
| 253464 | Yuengel | Ryan | 99.14 | A | | | 99.14 | A | |
| 213453 | Zink | Bryn | 86.93 | B | | | 86.93 | B | |
| | | | | | | | | | |
| | | Average: | 77.043333 | | | Average: | 85.547 | | |

Objective 4

| Student Info | | | | | |
|--------------|------------|------------|------------|-----|--|
| Name | | | Attendance | | |
| ID | Last Name | First Name | % | Let | |
| 236735 | Baker | Rebecca | 100 | A | |
| 218219 | Behlmann | Stephanie | 100 | A | |
| 208502 | Berlin | Victoria | 100 | A | |
| 247820 | Bexten | Brittany | 100 | A | |
| 217325 | Bivin | Jessica | 96.88 | A | |
| 232689 | Briles | Ashley | 100 | A | |
| 212485 | Cooper | Megan | 100 | A | |
| 247858 | Fritz | Grace | 100 | A | |
| 204874 | Helle | Matthew | 93.75 | A | |
| 209038 | Lancashire | Kayla | 96.88 | A | |
| 233006 | McKee | Miranda | 100 | A | |
| 234441 | McNamara | Jordan | 100 | A | |
| 215466 | O'Connell | Cassandra | 100 | A | |
| 230358 | Peters | Hallie | 100 | A | |
| 231973 | Riebkes | Hannah | 100 | A | |
| 237655 | Rizi | Sophia | 96.88 | A | |
| 217212 | Ryan | Joan | 100 | A | |
| 235840 | Schmidt | Ryan | 100 | A | |
| 253464 | Yuengel | Ryan | 100 | A | |
| 213453 | Zink | Bryn | 100 | A | |
| 253914 | Hart | Vern | | | |
| | | | | | |
| | | AVERAGE | 99.22 | | |
| | | | | | |

| Assessment Rubric Annual Assessment Report | | | | | |
|---|---|---|---|---|--|
| Assessment Component | Assessment Reflects Best Practices | Assessment Meets the Expectations of the University | Assessment Needs Development | Assessment is Inadequate | Comments: |
| Learning Outcomes | <input type="checkbox"/> Program learning outcomes are aligned to national standards | <input type="checkbox"/> Measurable program learning outcomes. <input type="checkbox"/> Learning outcomes are clearly articulated. | <input type="checkbox"/> Program learning outcomes have been identified and are somewhat measurable | <input type="checkbox"/> Program learning outcomes are not clear or measurable | <input type="checkbox"/> |
| Assessment Measures | <input type="checkbox"/> Multiple measures are used to assess student-learning outcomes. <input type="checkbox"/> Rubrics or guides used are provided. <input type="checkbox"/> All measurements are clearly described. | <input type="checkbox"/> Specific measures are clearly identified <input type="checkbox"/> Measures relate to program learning outcomes. <input type="checkbox"/> Measures can provide useful information about student learning. | <input type="checkbox"/> Some measurements are described, but need further description. | <input type="checkbox"/> Assessment measures do not connect to learning outcomes (objectives). <input type="checkbox"/> Assessment measures are not clear. <input type="checkbox"/> No assessment measures are established. | <input type="checkbox"/> |
| Assessment Results | <input type="checkbox"/> All learning outcomes are assessed annually; or a rotation schedule is provided. <input type="checkbox"/> Data are collected and analyzed to evaluate | <input type="checkbox"/> A majority of learning outcomes assessed annually. <input type="checkbox"/> Data collected and aggregated are linked to specific learning outcome(s). <input type="checkbox"/> Standards for student | <input type="checkbox"/> Data collected and aggregated for at least one learning outcome (objectives). <input type="checkbox"/> Data collection is incomplete <input type="checkbox"/> Standards for student performance and gaps in student learning are not | <input type="checkbox"/> Learning outcomes are not routinely assessed. <input type="checkbox"/> Routine data is not collected. <input type="checkbox"/> N/A Program is too new to have collected | <input type="checkbox"/> <input type="checkbox"/> |

| | <p>prior actions to improve student learning.</p> <p><input type="checkbox"/> Standards for performance and gaps in student learning are clearly identified.</p> | <p>performance and gaps in student learning are recognized.</p> | <p>identified.</p> | <p>assessment data.</p> | |
|----------------------------------|--|---|--|---|---|
| Assessment Component | Assessment Reflects Best Practices | Assessment meets the expectations of the University | Assessment needs Development | Assessment is Inadequate | Comments: |
| Faculty Analysis and Conclusions | <p><input type="checkbox"/> All faculty within the program synthesize the results from various assessment measures to form conclusions about each learning outcome.</p> <p><input type="checkbox"/> Includes input from adjunct faculty.</p> <p><input type="checkbox"/> Includes input from outside consultant.</p> | <p><input type="checkbox"/> Program faculty receive annual assessment results and meet to discuss assessment results.</p> <p><input type="checkbox"/> Specific conclusions about student learning are made based on the available assessment results.</p> | <p><input type="checkbox"/> Some program faculty receive annual assessment results</p> <p><input type="checkbox"/> Faculty input about results is sought</p> | <p><input type="checkbox"/> Faculty input is not sought.</p> <p><input type="checkbox"/> Conclusions about student learning are not identified.</p> <p><input type="checkbox"/> N/A Program recently started or too few graduates to suggest any changes.</p> | <p><input type="checkbox"/></p> |
| Actions to Improve Learning and | <p><input type="checkbox"/> A comprehensive</p> | <p><input type="checkbox"/> Description of the action to improve learning</p> | <p><input type="checkbox"/> Adjustments to the assessment plan are</p> | <p><input type="checkbox"/> No actions are taken to improve</p> | <p><input type="checkbox"/> The program has recently been</p> |

| | | | | | |
|-------------------|--|--|---|---|--|
| Assessment | <p>understanding of the program's assessment plan and suggestions for improvement.</p> <p><input type="checkbox"/> Clearly stated adjustments in curriculum as a result of assessment data.</p> <p><input type="checkbox"/> Actions are innovative in approach in attempt to improve student learning.</p> | <p>or assessment is specific and relates directly to faculty conclusions about areas for improvement.</p> <p><input type="checkbox"/> Description of action includes a timetable for implementation and identifies who is responsible for action</p> <p><input type="checkbox"/> Actions are realistic, with a good probability of improving learning or assessment.</p> | <p>proposed but not clearly connected to data</p> <p><input type="checkbox"/> Minimal discussion of the effectiveness of the assessment plan; minimal discussion of changes, if needed.</p> | <p>student learning.</p> <p><input type="checkbox"/> Actions discussed are not connected to data results or analysis.</p> <p><input type="checkbox"/> N/A Program recently started or too few graduates to suggest any changes.</p> | <p>revised so ongoing evaluation is key.</p> |
|-------------------|--|--|---|---|--|

Additional Comments:

- The chem 300 course is not listed on the assessment matrix, but it is mentioned in the action plans as a course with a desired enrollment for the program?
- The matrix and the data provided are not in alignment. If you look at the matrix form provided with the hard copy of the feedback you will see where data was reported on but it was not listed in the matrix as a data course, and where the matrix stated data would be provided but was not. The charts should be in alignment.