Course Information

Division: Science
Course Number: BIO 295
Title: Undergraduate Biological Research
Credits: 4
Developed by: David J. Henson
Lecture/Lab Ratio: 3 Lecture/3 Lab
Transfer Status: ASU NAU UA

<table>
<thead>
<tr>
<th>Activity Course</th>
<th>ASU</th>
<th>NAU</th>
<th>UA</th>
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<tbody>
<tr>
<td>No</td>
<td>BIO Dept Elective</td>
<td>Elective Credit</td>
<td>ECOL Departmental Elective</td>
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<tr>
<th>CIP Code</th>
<th>Assessment Mode</th>
<th>Semester Taught</th>
<th>GE Category</th>
<th>Separate Lab</th>
<th>Awareness Course</th>
<th>Intensive Writing Course</th>
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<tbody>
<tr>
<td>26.0100</td>
<td>Portfolio</td>
<td>Spring</td>
<td>None</td>
<td>Yes</td>
<td>No</td>
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Prerequisites
None

Educational Value
Undergraduate Research in Biology provides a unique learning experience for our students that can only be found in a select few community college settings across the nation.

Description
This course is a unique opportunity for students to apply and practice that which they have learned about the research process. Whether partnering with a mentor project or carrying out their personal research proposal, students discuss, analyze and critique their work through portfolio entries and team sessions coordinated by the instructor. Coursework culminates in a Poster Session of student research at the close of the semester.

Supplies
Budgets and equipment will be determined by the instructor on an individual project basis.
Competencies and Performance Standards

1. Determine a plan of action for the proposed research project.
   **Learning objectives**
   What you will learn as you master the competency:
   a. Identify the problem statement and proposal abstract.
   b. Conduct literature reviews for the topic chosen for research.
   c. Critique the experiment based upon the problem statement hypothesis.
   d. Determine the appropriate statistical analysis for the data to be collected.
   e. Appropriately cite research material within the research proposal.
   f. Collaborate a plan of action with instructor, mentor and/or research team.

   **Performance Standards**
   Competence will be demonstrated:
   o In personal interviews with instructor, mentor, or research team meetings
   o In class assignments
   o Within the context of a completed plan of action for the chosen research project
   o In appropriate portfolio entries

   Performance will be satisfactory when:
   o learner determines a personal interest research problem
   o learner uses learned strategies for gaining information using library, media, and historical archives
   o learner completes a research plan of action that contains all pertinent information necessary for consideration of a formal research project

2. Develop a time-line of events for the completion of their project.
   **Learning objectives**
   What you will learn as you master the competency:
   a. Determine appropriate time management strategies based upon the research design.
   b. Identify appropriate sequence of events for completion of research project in an established amount of time.

   **Performance Standards**
   Competence will be demonstrated:
   o In personal interviews with instructor, mentor, or research team meetings
   o In class assignments
   o By completion of a time budget check-off sheet within the project portfolio

   Performance will be satisfactory when:
   o learner completes research activities within parameters of the project's time budget check-off sheet
   o learner presents completed project poster at the designated poster party

3. Complete the appropriate actions involved in the experimental design.
   **Learning objectives**
   What you will learn as you master the competency:
   a. Use learned lab and field techniques in a manner that is both safe and appropriate for
the intended research.
b. Complete experimental design using identified processes in a consistent and valid manner.
c. Communicate with colleagues as a collaboration tool.
d. Collect and record all data in appropriate format.
e. Critique first hand the research design.

Performance Standards
Competence will be demonstrated:
- In personal interviews with instructor, mentor, or research team meetings
- In class and/or field assignments
- In appropriate log entries and narrative
- In appropriate portfolio entries

Performance will be satisfactory when:
- Learner completes actions of the research design
- Learner safely completes all actions of the research design
- Learner discusses research processes with instructor, mentor, and research team
- Learner presents collected data in appropriate format
- Learner and instructor/mentor critique research design

4. Analyze collected data from their project.

Learning objectives
What you will learn as you master the competency:
a. Determine the appropriate statistical analysis for the data to be collected.
b. Use appropriate figures, graphs and charts to organize data.
c. Communicate with colleagues as a collaboration tool.
d. Analysis for validity and bias within the project.

Performance Standards
Competence will be demonstrated:
- In personal interviews with instructor, mentor, or research team meetings
- In class and/or field assignments
- In appropriate log entries and narrative
- In appropriate portfolio entries
- In data presentation during poster party

Performance will be satisfactory when:
- Learner explains and identifies appropriate statistical analysis applicable to the experimental design
- Learner recognizes validity and bias as important components of research to be considered
- Learner represents completed data analysis during poster presentation
5. Prepare a written conclusion based upon the research hypothesis, experimental question, and data analysis.

**Learning objectives**

*What you will learn as you master the competency:*

a. Synthesis of a conclusion statement based upon collected data and its analysis.
b. Relate research conclusion to the original research hypothesis.
c. Incorporate appropriate literature review findings into the conclusion statement.
d. Communicate results in appropriate format.

**Performance Standards**

*Competence will be demonstrated:*

- In personal interviews with instructor, mentor, or research team meetings
- In class and/or field assignments
- In appropriate log entries and narrative
- In appropriate portfolio entries
- In completed poster presentation

*Performance will be satisfactory when:*

- Learner completes conclusion statement based upon determined research criteria
- Learner includes pertinent information from literature review in the conclusion statement
- Learner transcribes and correctly portrays conclusion research findings in his/her poster presentation

6. Summarize actions and thoughts pertaining to their project in a portfolio.

**Learning objectives**

*What you will learn as you master the competency:*

a. Recognize criteria for inclusion in project portfolio.
b. Portray appropriate entries within completed portfolio.
c. Communicate findings, opinions and reflections within journal and portfolio entries.
d. Critique research process.

**Performance Standards**

*Competence will be demonstrated:*

- In personal interviews with instructor, mentor, or research team meetings
- In class and/or field assignments
- In appropriate log entries and narrative
- In appropriate portfolio entries

*Performance will be satisfactory when:*

- Learner completes all appropriate entries into portfolio
- Learner communicates portfolio entries to project cohorts
- Learner participates in portfolio critique
- Learner relates project conclusions to portfolio entries
- Learner relates project experience to future educational plans
7. **Synthesize a poster presentation for public viewing.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Synthesize a premium poster to display all pertinent components of the research process.
b. Present completed poster to research team for critique.
c. Participate in critique of other project posters.
d. Practice public communication skills in the presentation of poster at poster party.
e. Communicate research findings in appropriate scientific venues.

*Performance Standards*

*Competence will be demonstrated:*

- In personal interviews with instructor, mentor, or research team meetings
- In class assignments
- At poster party presentation

*Performance will be satisfactory when:*

- Learner personally presents poster at a research poster party
- Learner accurately cites research material and recognizes cooperating instructors/mentors within poster presentation
- Learner uses library resources for research purposes
- Learner relates learned field and lab technique to an experimental design within the poster presentation
- Learner effectively portrays data in various chart and graph formats using computer technology and a variety of appropriate software programs
- Learner discusses and critiques research design, data and conclusions within the poster presentation

*Types of Instruction*

- Classroom presentation
- One-on-one research mentoring
- Field/lab independent application
- Team Analysis/critique

*Grading Information*

*Grading Rationale*

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<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>%</th>
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<tr>
<td>Journal Log -</td>
<td>100 pts</td>
<td>(13%)</td>
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<tr>
<td>Portfolio -</td>
<td>300 pts</td>
<td>(37%)</td>
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<tr>
<td>Poster Presentation -</td>
<td>200 pts</td>
<td>(25%)</td>
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<tr>
<td>Collaboration Mtgs. -</td>
<td>100 pts</td>
<td>(13%)</td>
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<tr>
<td>Time Budget Sheet -</td>
<td>100 pts</td>
<td>(12%)</td>
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**Total:** 800 points
Grading Scale

A  89.5% - 100%
B  79.5% - 89.4%
C  69.5% - 79.4%
D  59.5% - 69.4%
F  Below 59.4 %