BioSkills Guide: Developing and Validating Learning Outcomes for the Core Competencies

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Why develop competency learning outcomes?

- Vision and Change (AAAS, 2011) described 6 core competencies (i.e., skills) for undergraduate biology, but intentionally kept descriptions brief to encourage discussion among educators.
- To facilitate teaching, mapping, and assessment of competencies across curricula, we aimed to...

Collaboratively develop and nationally validate a “BioSkills Guide”: a set of measurable learning outcomes for the 6 core competencies for graduating general biology majors.

Vision and Change Core Competencies

- Process of Science
- Quantitative Reasoning
- Models & Simulations
- Interdisciplinary Nature of Science
- Communication & Collaboration
- Science & Society

What does the BioSkills Guide look like?

A portion of the BioSkills Guide draft for the competency “Process of Science” is shown below:

### PROCESS OF SCIENCE

<table>
<thead>
<tr>
<th>Program-Level Learning Outcomes</th>
<th>Course-Level Learning Outcomes</th>
<th>Examples of Activities and Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Literacy</td>
<td>Information Literacy</td>
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<tr>
<td>Literate</td>
<td>Literate</td>
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<tr>
<td>Interdisciplinary</td>
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<tr>
<td>Science</td>
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<td>Communication</td>
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<td>Collaboration</td>
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<tr>
<td>Science &amp; Society</td>
<td>Science &amp; Society</td>
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</tbody>
</table>

Who reviewed the BioSkills Guide?

- Institution Type
- Biology Subdiscipline
- DBER Experience
- Course Levels Taught

Example Review & Revision Process

Initial Outcomes:

- Program-Level Learning Outcomes
  - Describe the nature and utility of models and compare the strengths and limitations of different types of models (e.g., mathematical, conceptual, empirical).
  - Build and revise conceptual models (e.g., diagrams, cartoons, concept maps) to show how a biological system or mechanism works.
- Course-Level Learning Outcomes
  - Define and simplify complex problems using models.

Consort on outcomes has grown with iterative revisions

Consensus Level (% of respondents who rated ‘important’ or ‘v. important’)

- >90%
- 80%-90%
- 70%-80%
- <70%

Recruiting participants for a 15-min. survey

To determine if the outcomes represent the views of the broader biology community, we are currently looking for biology educators with a range of expertise (institution types, subdisciplines, course levels) to evaluate the outcomes via an online survey. We would appreciate your input. Please write your name and email address on the sign-up sheet next to poster to participate.

Acknowledgments

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References

American Association for the Advancement of Science (AAAS) (2011) Vision and Change in Undergraduate Biology Education: A Call to Action. Washington, DC.

Draft Development

- Faculty-crafted draft (n=20)
- Literature review
- Expert interviews (n=12)
- Workshops (n=24)

Review

- Surveys (n=93)
- Interviews (n=15)
- Workshops (n=115)
- ~60 reviewers per competency, spread over 5 rounds

Revision

- Survey
  - (n=20, 11-12 per competency)

Pilot Validation

- Survey
  - Example activities
  - References for published assessments, aligned by competency