Dive In and Explore...

Effective Grading and Assessment: Strategies to Enhance Student Learning, Faculty Satisfaction, & Institutional Success

Grading is a context-dependent, complex process that serves multiple roles:
1. Evaluation
2. Communication
3. Motivation
4. Organization
5. Faculty and student reflection

Assessment is the systematic gathering and analyzing of information (excluding course grades) to inform and improve student learning or programs of learning in light of goal-oriented expectations.

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Welcome to the SDB 5th Boot Camp for New Faculty! Your application to and participation in this professional workshop are evidence of your personal commitment to excellence in teaching, scholarship, and research!

Unless otherwise cited, the attached handouts are from Effective Grading: A Tool for Learning and Assessment in College by Barbara Walvoord and Virginia Johnson Anderson (Jossey-Bass, 2010). You will also find Creating Significant Learning Experiences by L. D. Fink (Jossey-Bass, 2013) and Assessing Student Learning: A Common Sense Guide by Linda Suskie (Jossey-Bass, 2009) are excellent faculty assessment resources.

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COGNITIVE DOMAIN

KNOWLEDGE
- describe
- calculate
- debate
- design
- rank

COMPREHENSION
- count
- discuss
- demonstrate
- diagram
- integrate
- revise

APPLICATION
- apply
- analyze
- construct
- categorize
- create
- evaluate

ANALYSIS
- define
- explain
- interpret
- differentiate
- prescribe

SYNTHESIS
- draw
- identify
- operate
- question
- solve

EVALUATION
- list
- locate
- review

The cognitive levels are illustrated in increasing complexity as described in Bloom, B. (Ed.) (1956) *Taxonomy of educational objectives.* New York, NY: McCay. The visual format and terms were selected and/or adapted from various other representations of Bloom's taxonomy.

Dr. V. Anderson (2012)
The Original Research Paper

In this assignment, you will compare two commercially available products to determine which is the better product.

You will CONDUCT original science research and COMPOSE a 1200 to 1500 word original research paper. Your final copy should be typed or word processed.

Audience: Write for your peers as junior colleagues in the scientific community.

Main purpose: Compare two commercially available products on the basis of 4 criteria and determine the better product as operationally defined.

Pattern: Scientific report form

Support and validation: In completing this assignment, demonstrate that you can conduct scientific inquiry. Your written report should demonstrate that you have formulated a hypothesis, designed a good experiment, controlled variables, defined key terms operationally, and interpreted data appropriately. In addition, you should demonstrate that you understand the scope and sequence of the scientific report format and the importance of quantification to scientific writing.

Meeting these AMPS, your paper should contain:

- Title of 25 words or less with descriptors
- Abstract
- Introduction section
- Methods and Materials section
- Results sections
- Conclusions and Implications section
- Reference section, if needed
- A minimum of 3 graphics with self-contained labels
- Preference tests with a N of 20
- Qualified judged tests with an N of 5
- Statistics appropriate to your expertise

Assignment by author
3. Evaluating Student Work Fairly And Consistently Against the Criteria

Assignment: To conduct an original scientific experiment comparing two commercially available products on at least four criteria, and to write up the experiment in scientific report format.

Below is the “title” portion of the PTA scale for the assignment.

Trait Title
5 - Is appropriate in tone and structure to science journal
   - Contains all necessary descriptors
   - Contains necessary brand names
   - Allows reader to anticipate design
4 - Is appropriate in tone and structure to science journal
   - Contains most descriptors
   - May lack brand names
   - Identifies function of experimentation
   - Suggests design
3 - Identifies function and brand name, but does not allow reader to anticipate design
2 - Identifies function or brand name, but not both
   - Lacks design information or is misleading
1 - Is patterned after another discipline or missing

Please use the PTA scale above to score these titles written by Anderson’s students. All titles were required to be 25 words or less.

_____ A. A Comparison of Prell® and Sauve Shampoo®
_____ B. The Battle of the Suds: Budweiser® and Wiedemann® Beer
_____ C. Would You Eat Machine-made or Home-made Cookies?
_____ D. A Comparison of ARIZONA® and SNAPPLE® Ice Tea for Ph, Residue, Light Absorbency, and Taste

Collecting Data and Communicating: Results

5. Student selects quantifiable experimental doctors and/or defines and establishes quantitative units of comparison; measures the quantifiable factors and/or units in appropriate quantities or intervals; student selects appropriate statistical information to be utilized in the results; when effective, student displays results in graphs with correctly labeled axes; data are presented to the reader in text as well as graphic from; tables or graphs have self-contained headings.

4. As 5 above, but the Student did not prepare self-contained headings for tables and graphs.

3. As 4 above, but data reported in graphs or tables contain materials that are irrelevant and/or not statistically appropriate.

2. Student selects quantifiable experimental factors and/or defines and establishes quantitative units of comparisons; fails to select appropriate quantities or intervals and/or fails to display information graphically when appropriate.

1. Student does not select, collect, and/or communicate quantifiable results.

Interpreting Data: Drawing Conclusions/Implications

5. Student summarizes the purpose and the finding of the research; student draws inferences that are consistent with the data and scientific reasoning and relates these to interested audiences; student explains expected results and offers explanations and/or suggestions for further research for unexpected results; student presents data honestly, distinguishes between fact and implication and avoids overgeneralizing; student organizes nonexperimental information to support conclusion; student accepts or rejects the hypothesis.

4. As 5 above, but student does not accept or reject the hypothesis.

3. As 4 above, but student overgeneralizes and/or fails to organize nonexperimental information to support conclusions.

2. Student summarizes the purpose and findings of the research; student explains expected results but ignores unexpected results.

1. Student may or may not summarize the results but, fails to interpret their significance to interested audiences.

Table 10.1. Student Scores on PTA for Science Reports, Before and After Pedagogical Changes.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Before</th>
<th>After</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>2.95</td>
<td>3.22</td>
<td>.24</td>
</tr>
<tr>
<td>Introduction</td>
<td>3.18</td>
<td>3.64</td>
<td>.14</td>
</tr>
<tr>
<td>Scientific format</td>
<td>3.09</td>
<td>3.32</td>
<td>.21</td>
</tr>
<tr>
<td>Methods and materials</td>
<td>3.00</td>
<td>3.55</td>
<td>.14</td>
</tr>
<tr>
<td>Nonexperimental information</td>
<td>3.18</td>
<td>3.50</td>
<td>.24</td>
</tr>
<tr>
<td>Designing the experiment</td>
<td>2.68</td>
<td>3.22</td>
<td>.07</td>
</tr>
<tr>
<td>Defining operationally</td>
<td>2.66</td>
<td>3.50</td>
<td>.01</td>
</tr>
<tr>
<td>Controlling variables</td>
<td>2.73</td>
<td>3.18</td>
<td>.10</td>
</tr>
<tr>
<td>Collecting data</td>
<td>2.86</td>
<td>3.36</td>
<td>.14</td>
</tr>
<tr>
<td>Interpreting data</td>
<td>2.90</td>
<td>3.59</td>
<td>.03</td>
</tr>
<tr>
<td>Overall</td>
<td>2.93</td>
<td>3.42</td>
<td>.09</td>
</tr>
</tbody>
</table>

Note: The P value given is the probability, under the null hypothesis, that the difference in the two groups is attributable to chance and not to treatment.
<table>
<thead>
<tr>
<th>Rubric Level</th>
<th>TEST BLUEPRINTING SCORING with RUBRIC</th>
<th>Hypothetical Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Student is able to BOTH select and supply appropriate scientific vocabulary at a proficient level (80% accuracy of above).</td>
<td>18/50 students 36%</td>
</tr>
<tr>
<td>3</td>
<td>Student is able to BOTH select and supply appropriate scientific vocabulary at an adequate (passing 70%) level.</td>
<td>19/50 students 38%</td>
</tr>
<tr>
<td>2</td>
<td>Student is able to select OR supply appropriate scientific vocabulary, but not both, at an adequate (passing) level.</td>
<td>12/50 students 24% *</td>
</tr>
<tr>
<td>1</td>
<td>Student is not able to select or supply appropriate scientific vocabulary at a passing level.</td>
<td>1/50 students 2%</td>
</tr>
</tbody>
</table>

* Note: 11 of the 12 students making a 2 on the rubric could not supply terms at a passing level.

1. How were we doing on this first test?

2. What would you do to differently to “close the loop”?
Some examples of DIRECT EVIDENCE:

- Rating of student skills by field experiences supervisors or employers
- Scores/pass rates on certification/licensure exams if they assess learning outcomes
- Capstone experiences
- Written work, posters, or various forms of presentation scored using a rubric
- Portfolios of student work
- Scores on multiple choice essay exams accompanied by test-blueprinting
- Score gains between entry and exit on published or local test writing samples
- Observations of student behaviors undertaken systematically with recorded notes
- Summaries and assessments of electronic discussion threads
- "Think-alouds" and focused discussions transcribed, audio-taped, or video-taped
- Data from student response systems (clickers) in response to classroom questions
- Feedback from computer simulated tasks including patterns of action and decisions
- Student reflections on attitudes, values, beliefs if developing them is an outcome

Some examples of INDIRECT EVIDENCE:

- Assignment and exam grades if not accompanied with rubrics or criteria
- Retention and graduation rates
- Placement of graduates into appropriate career positions
- Alumni perceptions of their career responsibilities and satisfaction
- Student ratings of their knowledge and skills on what they learned in the program
- Questions/end of course evaluations about course, not the instructor
- Student participation rates in research, publications, and conference presentations
- Honors, awards, and scholarships earned by students or alumni
- Voluntary gifts from alumni and employers
- Student, alumni, and employer satisfaction with learning collected through surveys, exit interviews, or focus groups
Please check EACH of the activities in which you have participated as you have completed your Biology major:

1. Attended Biology Department seminar presented by TU faculty or graduate students.
2. Attended Biology Department seminar presented by an outside speaker.
3. Attended a university seminar on biological topics.
4. Attended a professional science or research society meeting (ASB, ASM, HAPS etc.)
5. Presented a student paper at professional science or research society meeting.
6. Worked on a collaborative science project that received a single grade for the group.
7. Participated in an internship, work-study program, or travel study course.
8. Worked as a laboratory or research science assistant in a hospital, veterinary, or clinical setting.
9. Worked as a laboratory or research assistant in a governmental, commercial and/or industrial setting.
10. Assisted a faculty member in collecting research data.
11. Presented a science seminar in a class OTHER THAN Biology Majors Seminar.
12. Participated in an environmentally-oriented campus or community organization.
13. Held a leadership position in an environmentally-oriented campus or community organization.
14. Worked on one or more college laboratory or research group projects with ethnically diverse co-workers.
15. Worked on one or more college laboratory or research group projects in which contributing members/leaders were both male and female.
16. Used word processor to prepare science assignments.
17. Used computer programs (statistics, spread sheets, etc. other than word processing) and/or Internet resources to complete course work.
18. Used computer-assisted graphics for biology projects.

19. Designed a computer program to facilitate science work.

20. Used scientific equipment not found in basic Biology course laboratories (i.e. applied research tools).

21. Participated in one or more TûU biology organizations (Bio Club, Minority Biology Club, Tri Beta, etc.).

22. Participated in a voluntary science teaching or tutoring activity for local schools or clubs (4-H, Scouts, etc.).

23. Served as a volunteer naturalist or guide for local science resource.

24. Collected biological data and/or samples on TûU field trips or as part of independent interest or course work.

25. Composed an original scientific research paper to describe field or laboratory research data that you collected and analyzed.

26. Used VICTOR, UNCOVER, BIOABSTRACTS, or SCIENCE CITATION INDEX to identify scientific information sources.

27. Read two articles independently (not assigned) from scientific journals in the last three months.

28. Participated in career training seminars, workshops, or interviews for professional schools.

29. Received a summer research grant or training program.

Please tell us any other activities related to biology, your set of attitudes and values about science, or your ability to become a lifelong learner that should be included on this questionnaire.

Please VOLUNTEER this information: SEX  Male  Female

BIOLOGY GPA:  Under 2.75  2.75 to 3.25  3.25 to 4.00

NUMBER OF YEARS COMPLETED AT TûU:  1  2  3  4

IF MINORITY STUDENT:  African-American  Asian-American  Hispanic American  Native American  Foreign student
GOAL:

After completing a science Gen Ed course (BIOL 110), students should be able to demonstrate the ability to identify, describe, critique and/or respond to as well as construct various components of the scientific process (i.e. make observations, inferences, operational definitions, design experiments, draw conclusions, implications, and control variables, etc.).

PERFORMANCE:

Five task sets on the pilot common test segment were designated to be reflective of these scientific skills. Students scores were aggregated and scores as shown below.

Score 4  Student is able to CONSTRUCT various key components of the scientific process within an appropriate context. Not measured in this pilot test

Score 3  Student is able to name, identify within context, question or critique various components of the scientific method at a proficient level (80% accuracy or above). 40/45

Score 2  Student is able to identify, describe, or critique various components or the scientific method at an adequate (passing) level. 5/45

Score 1  Student is NOT able to do these tasks at 60% competency 0/45

IMPLICATIONS AND IMPORTANT FURTHER CONSIDERATIONS

BIOL 110 students are developing these important Gen Ed skills at a level that we are very pleased with, but we recognize that the pilot instrument did not include a measure for constructing components of the scientific method. At the present time, we are considering ways, particularly in the laboratory setting, to examine this skill.