Bioscience Technology

Critical Thinking Assessment Results

Spring 2010

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Summary of Assessment Strategy

Notebooks were collected at the end of the term from students enrolled in BIT 109 and BIT 215. BIT 109 is the first laboratory course in Bioscience Technology and, as such, this assessment represents a baseline of student critical thinking at a point where students know how to technically record information in a laboratory notebook, but are still developing their ability to think critically about the work they are documenting. The BIT 215 students are completing their program requirements and, as such, the BIT 215 notebooks should represent an endpoint assessment of critical thinking ability.

Each notebook was assessed by the instructor. The assessment method used was not the same as that used for determination of grades. Instead, we used the rubric shown below (modified from the WSU rubric):

PCC Bioscience Technology May 2010 Critical Thinking Rubric

modified from WSU General Educ critical thinking rubric.

Rubric Component	4	3	2	1
Identifies and summarizes the problem/question at issue.	Accurately identifies the problem/question and provides a well-developed summary.	Accurately identifies the problem/question and provides a brief summary.	Identifies the problem/ question and provides a poor summary or identifies an inappropriate problem/question.	Does not identify or summarize the problem/question accurately if at all.
Identifies and assesses the quality of supporting data/evidence	Provides a well-developed examination of the evidence and questions its accuracy,	Examines evidence and questions the quality. Distinguishes between	Merely repeats information provided. Does not justify position or distinguish	Does not identify or assess the quality of supporting evidence.

	relevance, and completeness. Clearly distinguishes between fact and opinion.	fact and opinion.	between fact and opinion.	
Identifies and considers the influence of indirect variables on the experimental or procedural results.	Accurately identifies and provides a well-developed explanation of all variables with a clear sense of scope.	Accurately identifies and provides an explanation of some or most variables	Does not explain potential relevant variables; provides inaccurate information; or merely provides a list.	Does not identify or consider any relevant indirect variables.
Demonstrates higher level thinking by interpreting the relevance of experimental results to past and future procedures and experiments	Accurately identifies the relevance of results in appropriate context and provides a well-developed explanation.	Accurately identifies relevance of the results and provides a brief explanation.	Does not explain, or merely lists inferred meanings.	Provides inaccurate information and/or fails to interpret relevance of results.
Identifies and evaluates conclusions and scientific or higher order technical evidence	Accurately identifies conclusions, implications and consequences with a well-developed explanation. of own assertions.	Accurately identifies conclusions, implications, and consequences with a brief evaluative summary.	Does not explain, provides inaccurate information, or merely provides a list of ideas; or only discusses one area.	Does not identify or evaluate any conclusions, implications or consequences.

Results

BIT 109 – 6 student notebooks were assessed and the results were as follows:

Scores for all criteria were 3 or lower. No BIT 109 students scored in the "4" column.

The total scores were: 1 student scored "6", 2 scored "10", 2 scored "13" and 1 scored "14".

The average score for the BIT 109 students was 11.

BIT 215- 4 student notebooks were assessed and the results were as follows:

Scores for all criteria were 3 or higher. No BIT 215 students scored in the "2" or "1" column.

The total scores were: 2 students scored "17", 1 student scored "18" and 1 student scored "20".

The average score for the BIT 215 students was 18.

Interpretation of Results

It is difficult to make definitive conclusions because the sample size is simply too small. However, we did observe a distinct pattern in the scoring. The advanced students show strong critical thinking ability as measured by our method. The laboratory notebooks are a good sample for assessing critical thinking ability for the following reasons:

- We require lab notebooks in all our BIT lab classes.
- Students are highly motivated to show their best work in their lab notebooks.
- Lab notebook documentation is an ongoing assignment that has at its core critical thinking.

One interesting note is that our BIT students enter our program with a diversity of prior educational experiences; several of our students have prior B.S. or even graduate degrees. While prior experience seems to result in a slightly higher score in our BIT 109 sample, it is interesting to note that the scores did not match the much higher level of the BIT 215 students, despite the fact that both classes included post-baccalaureate students.

With regard to the results themselves, I found it interesting to note that the BIT 215 students who scored in the "3" range did so because of the brevity of their notebook entries. It might be worthwhile in the future to include a second assessment tool, such as a final exam or essay question that is designed to assess critical thinking.

Suggestions for improvement of this Assessment Strategy

- Assess notebooks at three points in the program: BIT 109, BIT 205 and BIT 215
- Assess multiple notebooks from the same individual.
- Have more than one instructor assess each notebook.

NOTE: Our SAC has only one full time instructor, so it will be necessary to pay part time faculty, or to recruit them to volunteer their time in order to accomplish this.

Lessons Learned and Impact on Teaching

In assessing the notebooks, I realized that students do not always take the time needed to fully analyze and document their analysis of data or results. In the future, I will adjust my teaching of lab notebook documentation to include examples that will help students recognize the difference between complete and incomplete analytical reporting. Peer review of lab notebook entries are a strategy I will test in my own classes.