Discipline Outcome
Scientific Literacy - defined by a broad scientific vocabulary with an effective ability to communicate through speech, visuals, and writing

Assessment Author(s)
Jenai Rutledge

Measure 1 Type:
Direct

Dedicated assessment test

Measure 1 Description:
Students in BIO105 and BIO111 courses were evaluated during the spring 2015 semester using questions from a short assessment designed and agreed on by the biology faculty. The assessment was be given to students at the start of the semester (on the first day of classes) as a pre-test and then the exact same assessment was given as a post-test at the end of the semester. Three questions on this assessment were designed to evaluate scientific literacy specifically.

Measure 1 Sample Size:
250

1) Describe the benchmark for this measure.
Success will be measured as a significant increase in scores ($p<= 0.05$) between pre and post tests. Additionally, the department expects at least a 10% increase in average scores between pre and post test for the benchmark to be met.

2) What is the rationale for choosing this benchmark?

Based on previous assessment cycles and expected growth the Biology faculty agreed on a 10% increase in performance on this assessment as a measure of adequate student growth. The paired t-test allows us to also evaluate relative improvement on questions where student performance on the test was high on the pre-test.

This discipline outcome was

Surpassed benchmark

Measure 1 Results:

Three questions on a pre/post test given on the first and last day of the term, respectively, were used to assess scientific literacy of students in the introductory biology courses, BIO111 (General College Biology I) and BIO105 (Science of Biology). A total of 159 students took both the pre and post tests. Between pre/post test an average of 17.1% increase was observed in student scores on these questions. Additionally, relative student performance, assessed using a paired t-test, increased significantly between the pre- and post- tests ($t=4.4911$; $df=158$; $p=0.0001$). These trends persist when data from students in each course are assessed individually (BIO111, paired t-test: $t=3.2903$; $df=138$; $p=0.0002$; and BIO105, paired t-test: $t=2.6042$; $df=19$; $p=0.0174$).

When examined individually, students performance improved by $>10\%$ on all but one of the three questions (27.3%, 5.9%, and 17.86%). On the question for which a $<10\%$ increase was observed, 70% of the students sampled answered this question correctly on the pre-test. Interestingly, when the data from BIO111 and BIO105 are analyzed separately, performance on this question increased by only 5% for BIO111 students but increased by 10.5% for BIO105 students.

DIS Sci Lit Graph.xlsx

1) How did unit/department performance compare to the benchmark?

A benchmark of a 10% increase that was statistically significant was set. This benchmark was surpassed as a 17.1% was increase was observed overall (16.3% increase for students in BIO111 and 21% increase for students in BIO105). This increase was extremely statistically significant as determined via a paired t-test ($t=4.4911$; $df=158$; $p=0.0001$).

When analyzed separately, performance on all but 1 of the questions increased by $>10\%$. On the question for which performance increased by less than 10%, more in depth analysis reveals that most students (70%) answered this question correctly on the pre-test.

2) How does the data compare to the previous year, if applicable?
This is a new assessment for the biology department and thus the data collected this year cannot be compared to previous years’ data.

1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong exceeds benchmark, neutral meets benchmark, or weak misses benchmark)?

Surpassed benchmark

2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?

Because this benchmark was exceeded, continued efforts to teach scientific literacy in our general biology courses will be maintained. However, for one of the questions used to assess proficiency in science literacy, approximately 70% of students answered correctly on the pre-test. For this reason, revision of this question will be considered.

3) How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?

Our success in this area has helped us recognize one of the strengths of our current general biology curriculum. We will ensure to maintain current standards of education regarding scientific literacy as we continue to update and improve curriculum in the coming year.

Further Action:

Further Action Planned

Describe the action plan:

Possible revision of the question on which 70% of students were able to answer correctly on the pre-test should be considered to better assess growth due to the course instruction.

Person/ Group responsible for action

Jenai Rutledge

Target Date for implementation of the action

08/01/2017

Priority
Discipline Outcome

Critical Thinking - the ability to use critical thinking skills to identify problems, analyze solutions, make informed decisions, and ethical choices.

Assessment Author(s)

Jenai Rutledge

Measure 1 Type:

Direct

Dedicated assessment test

Measure 1 Description:

Students in BIO105 and BIO111 courses were evaluated during the spring 2015 semester using questions from a short assessment designed and agreed on by the biology faculty. The assessment was be given to students at the start of the semester (on the first day of classes) as a pre-test and then the exact same assessment was given as a post-test at the end of the semester. Three questions on this assessment were designed to evaluate critical thinking specifically.

Combined average percent changes will be calculated from the pre and post test. Additionally, results will be analyzed using a paired t-test to determine significance of changes in performance on the questions addressing this learning outcome.

Measure 1 Sample Size:

250

1) Describe the benchmark for this measure.

Success will be measured as a significant increase in scores ($p<=0.05$) between pre and post tests. Additionally, the department expects at least a 10% increase in average scores between pre and post test for the benchmark to be met.
2) What is the rationale for choosing this benchmark?

Based on previous assessment cycles and expected growth the Biology faculty agreed on a 10% increase in performance on this assessment as a measure of adequate student growth. The paired t-test allows us to also evaluate relative improvement on questions where student performance on the test was high on the pre-test.

This discipline outcome was

Surpassed benchmark

Measure 1 Results:

Three questions on a pre/post test given on the first and last day of the term, respectively, were used to assess critical thinking of students in the introductory biology courses, BIO111 (General College Biology I) and BIO105 (Science of Biology). A total of 159 students took both the pre and post tests (139 BIO111 students, 20 BIO105 students). Between pre/post test an average of 11.8% increase was observed in student scores on these questions. Additionally, relative student performance, assessed using a paired t-test, increased significantly between the pre- and post-tests (t=3.222; df=158; p=0.0015). These trends persist when data from students in each course are assessed individually (BIO111, paired t-test: t=2.122, df=138, p=0.029; and BIO105, paired t-test: t=3.107; df=19; p=0.0058).

When examined individually, students performance improved by >10% on all but one of the three questions (8.7%, 11.9%, 15%). On the question for which a <10% increase was observed, 73% of the students sampled answered this question correctly on the pre-test. Interestingly, when the data from BIO111 and BIO105 are analyzed separately, performance on this question increased by only 7% for BIO111 students but increased by 17.65% for BIO105 students.

1) How did unit/department performance compare to the benchmark?

A benchmark of a 10% increase that was statistically significant was set. This benchmark was surpassed as a 11.8% increase was observed overall. This increase was very statistically significant as determined via a paired t-test (t=3.222; df=158; p=0.0015). When analyzed by course, student performance on these questions increased by 30.8% in BIO105, but only by 8.5% in BIO111. The fact that the increase observed for students in BIO111 was shy of the 10% benchmark may reflect either differences in base knowledge of BIO111 students relative to BIO105 students or may indicate a difference in curriculum emphasis that may need to be addressed further. From initial analysis of pre-test performance on these target questions, it appears the difference likely most reflects differences in base knowledge between the groups of students - however, further and repeated examination of these questions and student performance is needed to further elucidate whether revision to these questions and/or related curriculum is warranted.

When analyzed separately, performance on all but 1 of the questions increased by >10%. On the question for which performance increased by less than 10%, more in depth analysis reveals that most students (73%) answered this question correctly on the pre-test.
2) **How does the data compare to the previous year, if applicable?**

This is a new assessment for the biology department and thus the data collected this year cannot be compared to previous years' data.

3) **If multiple measures were used, how do they compare to each other?**

When analyzed separately, performance on all but 1 of the questions used to assess critical thinking increased by >10%. On the question for which performance increased by less than 10%, more in depth analysis reveals that most students (73%) answered this question correctly on the pre-test.

1) **Based on the findings, how does the unit/department rate performance in regards to this outcome (strong exceeds benchmark, neutral meets benchmark, or weak misses benchmark)?**

**Surpassed benchmark**

2) **How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?**

Because this benchmark was exceeded, continued efforts to teach critical thinking in our general biology courses will be maintained. However, for one of the questions used to assess proficiency in science literacy, approximately 70% of students answered correctly on the pre-test. For this reason, revision of this question will be considered.

3) **How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?**

Our success in this area has helped us recognize one of the strengths of our current general biology curriculum as well as some possible differences (that may need further consideration going forward) between students who take BIO105 compared to those enrolled in BIO111. Any concrete conclusions regarding whether it is valid to continue to assess both BIO105 and BIO111 students and pool these data should be made lightly until more data can be collected and we have had the opportunity to examine whether these trends persist. We will work to maintain current standards of education regarding critical thinking as we continue to update and improve curriculum in the coming year.

**Further Action:**

Further Action Planned
Describe the action plan:

At this time, more data are needed before any major changes to the assessment procedure and/or curriculum are made. However, it may be worth revising the question on which more 73% of the students answered correctly on the pre-test. This option will be discussed further with the department.

Person/ Group responsible for action

Biology department

Target Date for implementation of the action

08/01/2017

Priority

Low

Learning Outcome

Information Management

Assessment Author(s)

Jenai Rutledge

Measure 1 Type:

Direct

Dedicated assessment test

Measure 1 Description:

Students in BIO105 and BIO111 courses were evaluated during the Fall 2016 semester using questions from a short assessment designed and agreed on by the biology faculty. The assessment was given to students at the start of the semester (on the first day of classes) as a pre-test and then the exact same assessment will be given as a post-test at the end of the semester. Two questions on this assessment were designed to evaluate information management specifically. Combined average percent changes will be calculated from the pre and post test. Additionally, results will be analyzed using a paired t-test to determine significance of changes in performance on the questions addressing this learning outcome.
Measure 1 Sample Size:
250

1) Describe the benchmark for this measure.

Success will be measured as a significant increase in scores (p<= 0.05) between pre and post tests. Additionally, the department expects at least a 10% increase in average scores between pre and post test for the benchmark to be met.

2) What is the rationale for choosing this benchmark?

Based on previous assessment cycles and expected growth the Biology faculty agreed on a 10% increase in performance on this assessment as a measure of adequate student growth. The paired t-test allows us to also evaluate relative improvement on questions where student performance on the test was high on the pre-test.

This learning outcome was

Missed benchmark

Measure 1 Results:

Two questions on a pre/post test given on the first and last day of the term, respectively, were used to assess information management of students in the introductory biology courses, BIO111 (General College Biology I) and BIO105 (Science of Biology). A total of 159 students took both the pre and post tests (139 BIO111 students, 20 BIO105 students). Between pre/post test an average of 4% increase was observed in student scores on these questions collectively. This was a non-significant change in students scores when analyzed via a paired t-test (t=0.561, df=158, p=0.5758. However, there is reason to believe that this is not an accurate reflection of student proficiency for this learning outcome, as performance on the two questions used to assess this learning outcome was very conflicting. On the first question used the percent change between pre and post tests was -33.9%; whereas, the percent change on the second question used was 26.3%.

When the change in score is analyzed for the second question only between pre-/post- tests by student using a paired t-test the difference becomes significant (t=3.797, df=158, p=0.0002). Similar results are observed when scores from students in BIO111 and BIO105 are analyzed separately.

Additionally, relative student performance, assessed using a paired t-test, increased significantly between the pre- and post- tests (t=3.222; df=158; p=0.0015). These trends persist when data from students in each course are assessed individually (BIO111, paired t-test: t=2.122, df=138, p=0.029; and BIO105, paired t-test: t=3.107; df=19; p=0.0058).

Info management both questions.pdf

SLO Info management q10 only.pdf
1) How did unit/department performance compare to the benchmark?

A benchmark of a 10% increase that was statistically significant was set. This benchmark was not met if both questions used to assess this learning outcome were analyzed together. When analyzed together a 4% increase was observed which was not a significant improvement in student performance on these questions ($t=0.5607$, $df=158$, $p=0.5607$). However, doubts regarding the validity of one of the questions used to assess this outcome were raised during the initial testing of students at the start of the term and there continues to be reason to believe the question was flawed. Because of this, the data for each question were also analyzed separately. When the flawed question is not considered, the benchmark was met, as a 26.3% increase pre-/post-test performance was recorded. This also is a statistically significant increase (paired t-test: $t=3.797$, $df=158$, $p=0.0002$).

2) How does the data compare to the previous year, if applicable?

This is a new assessment for the biology department and thus the data collected this year cannot be compared to previous years’ data.

3) If multiple measures were used, how do they compare to each other?

See above explanation.

1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong exceeds benchmark, neutral meets benchmark, or weak misses benchmark)?

Missed benchmark

2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?

These results suggest that revision of one of the questions is required prior to the next round of assessment. The question for which growth was observed will remain as is, but the other question will be modified to improve clarity.

3) How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?
At this time, it is difficult to determine whether modifications to curriculum need to be made. Although the benchmark was not met for this outcome, this is likely in part due to a flaw in the assessment. The other question used to assess this information management showed large improvements in student performance suggesting that the current curriculum may be sufficient. Until more, reliable data are gathered, no changes to curriculum or resources is currently planned.

Further Action:

Further Action Planned

Describe the action plan:

After at least one additional year of data collection, we plan to revisit and review this learning outcome to determine if changes to curriculum and/or student resources are need to help students grow in the area of information management. Immediate changes will be made to the flawed question.

Person/ Group responsible for action

Biology department

Target Date for implementation of the action

08/01/2017

Priority

High

Learning Outcome

Quantitative Reasoning

Assessment Author(s)

Jenai Rutledge

Measure 1 Type:

Direct

Dedicated assessment test

Measure 1 Description:
Students in BIO105 and BIO111 courses were evaluated during the Fall 2016 semester using questions from a short assessment designed and agreed on by the biology faculty. The assessment was be given to students at the start of the semester (on the first day of classes) as a pre-test and then the exact same assessment was given as a post-test at the end of the semester. Two questions on this assessment were designed to evaluate quantitative reasoning specifically. The questions for this outcome involve interpreting and evaluating a graph.

Combined average percent changes will be calculated from the pre and post test. Additionally, results will be analyzed using a paired t-test to determine significance of changes in performance on the questions addressing this learning outcome.

**Measure 1 Sample Size:**

250

1) Describe the benchmark for this measure.

Success will be measured as a significant increase in scores ($p \leq 0.05$) between pre and post tests. Additionally, the department expects at least a 10% increase in average scores between pre and post test for the benchmark to be met.

2) What is the rationale for choosing this benchmark?

Based on previous assessment cycles and expected growth the Biology faculty agreed on a 10% increase in performance on this assessment as a measure of adequate student growth. The paired t-test allows us to also evaluate relative improvement on questions where student performance on the test was high on the pre-test.

This learning outcome was Missed benchmark

**Measure 1 Results:**

Two questions on a pre/post test given on the first and last day of the term, respectively, were used to assess quantitative reasoning of students in the introductory biology courses, BIO111 (General College Biology I) and BIO105 (Science of Biology). A total of 159 students took both the pre and post tests (139 BIO111 students, 20 BIO105 students). Between pre/post test an average of 7.8% DECREASE was observed in student scores on these questions. The relative student performance between pre- and post-tests was not statistically significant (paired t-test: $t=0.9367$, df=158, $p=0.35$). These results remain consistent when data from students in BIO111 and BIO105 are analyzed separately.

When analyzed separately, performance on both questions used to assess this outcome is approximately the same (-2.82%, -12.05% change between pre- and post- tests).

1) How did unit/department performance compare to the benchmark?

A benchmark of a 10% increase that was statistically significant was set. Neither benchmark was met. Student performance showed a negative percent change (-7.79% overall) and as such, no statistically significant increase in scores was observed.
2) How does the data compare to the previous year, if applicable?

This is a new assessment for the biology department and thus the data collected this year cannot be compared to previous years' data.

3) If multiple measures were used, how do they compare to each other?

Performance on both questions used to assess this outcome was similarly negative (-2.8% and -12% change between pre- and post-test scores).

1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong exceeds benchmark, neutral meets benchmark, or weak misses benchmark)?

Missed benchmark

2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?

These results are surprising. Evaluation of the questions used to assess this outcome suggest they are strong questions and should accurately assess quantitative reasoning abilities of students. As such, a department-wide conversation about strategies to increase curriculum about quantitative reasoning may be warranted. Obviously one year's worth of data is not a terribly robust assessment of the department or curriculum as a whole, but these data may highlight a weakness in current general biology curriculum.

3) How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?

At this time it is difficult to predict what changes may be needed to help strengthen student proficiency with quantitative reasoning. However, a department-wide dialogue will commence to allow us as a department to reflect on how we address quantitative reasoning will be initiated with the goal of identifying areas where instruction regarding this outcome may be enhanced. Further data collection using the same questions will also help us better understand if a true weakness in curriculum/resources exist.

Further Action:

Further Action Planned

Describe the action plan:
Evaluation of current curriculum regarding quantitative reasoning with the department will be initiated with the intent to identify areas where this concept can be addressed more fully.

Person/ Group responsible for action
Biology department

Target Date for implementation of the action
05/11/2017

Priority
High