Summary of Science Lab Report scored with common rubric
General Education Assessment
2009-2010

Introduction:

During the 2009-2010 school year, the General Education program outcomes were revised by a working group consisting of instructional coordinators from the state campuses and division chairs at the national campus. These program outcomes were reviewed and recommended by the curriculum committee during the summer of 2009. Accompanying this process was an assessment plan for the 09-10 school year. The assessment plan was reviewed by the curriculum committee and the assessment committee. One result of that process is assessment of the following General Education outcome on scientific reasoning: **Outcome 3.4**: Define and explain scientific concepts, principles, and theories of a field of science. **Outcome 3.5:** Perform experiments that use scientific methods as part of the inquiry process.

This is the first year that the college has used common assignments to assess the General Education Program across all sites. The idea was borrowed from Capital Community College where the use of common assignments to assess general education has been a success. The science faculty members were asked to collect a science lab report written during the fall semester. Lab reports were collected from SC 120 at 2 different sites, SC 130 at 2 different sites, SC 117 at two different sites and SC 255 from National Campus only. Selected reports were scored against a common rubric by science faculty Dana Lee Ling, Frankie Harriss and Dr. Giuseppe Cuboni. Ms. Harriss and Dr. Cuboni did not teach any of the science lab courses and Mr. Lee Ling did not score the reports from his course. What follows is a description of the methods used to assess the reports written, the results of the assessment and recommendations. Examples of the assignment, cover page, instructions, and rubric are found in Appendix B.

Method:

Faculty who teach sciences with a lab routinely assign written lab reports as part of the course. A rubric used for General Education assessment was borrowed from McKendree University, Lebanon, Illinois. An instruction page was prepared for the students with specific instructions along with one for the instructor on how to administer the assignment. The assignment could be used as a graded assignment for the class if the instructor chose to do so. The students used ID numbers on the copies submitted for the assessment to keep all information confidential. A cover sheet containing the ID number, campus, class, questions asking students what they liked or disliked about the assignment and how confident the student felt about writing the lab report along with the scoring rubric were included in each student packet. Appendix C contains samples of the assignment sheets and scoring rubric.

One hundred fifty-six (156) lab reports were collected from Kosrae, Pohnpei, Chuuk and Yap state campuses and National campus. Using a confidence interval of 90%, a stratified random sample was taken which resulted in a total of sixty-one (61) lab reports that were actually scored. Two science instructors that didn't teach any of the lab sciences during the fall semester along with one instructor who taught one section of a course where the reports were collected scored the lab reports using the rubric. The instructor who taught a lab science did not score his own reports. The rubric is analytical with the four criteria being Metric: Scientific Procedures and reasoning, Metric: Strategies, Metric: Scientific communication/using data, and Metric: Scientific concepts and related content, and there is a possible of 8 points for each criteria. A perfect total score would equal 32 points. Each lab report was read by two readers and the scores by each reader were added together for a total score for each criteria and overall.

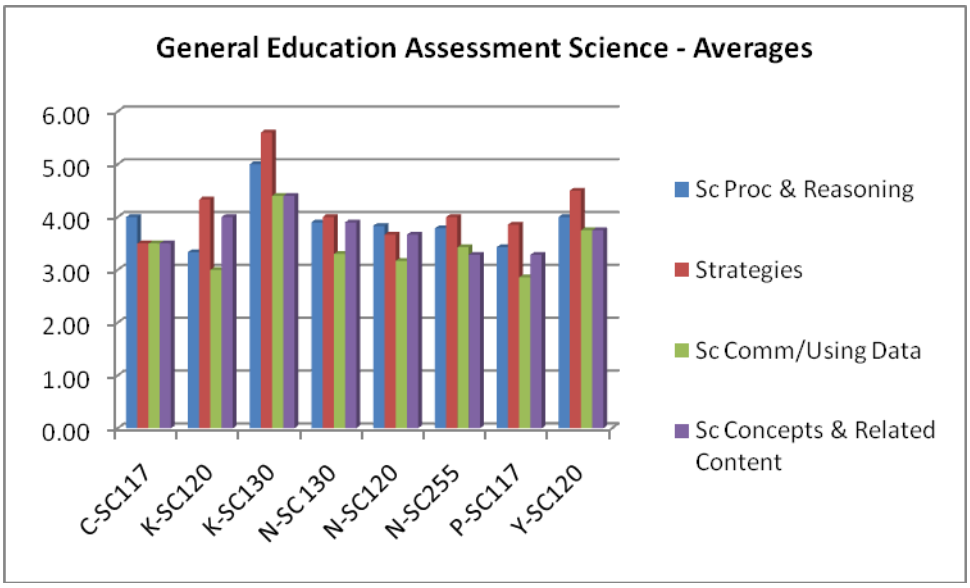
The results of the assessment for this school year will be used to establish baseline data and set goals for improvement for the next assessment cycle. Various tables and charts below reveal the actual levels of the students' responses.

Analysis of Results:

Total: Institution wide the average total score was 14.95 of 32 possible points. In each area students averaged 3.89 on scientific procedures and reasoning, 4.05 on strategies, 3.38 on scientific communication using data, and 3.64 on scientific concepts and related content. Students from Kosrae in Physical Science ranked highest overall with an average of 19.4. Physical Science students at National campus averaged 15.1. Yap students in Biology averaged 16, while Biology students at Kosrae averaged 14.67 and National campus Biology students averaged 14.33. Chuuk campus students in Tropical Environments averaged 14.50, while Pohnpei campus students averaged 13.43. Finally, National campus students in Zoology averaged 14.5.

Science averages

Campus	Course No	Sc Proc & Reasoning	Strategies	Sc Comm/Using Data	Sc Concepts & Related Content	Total	Count
Chuuk	SC117	4.00	3.50	3.50	3.50	14.50	6
Pohnpei	SC117	3.43	3.86	2.86	3.29	13.43	7
Kosrae	SC130	5.00	5.60	4.40	4.40	19.40	5
National	SC 130	3.90	4.00	3.30	3.90	15.10	10
National	SC255	3.79	4.00	3.43	3.29	14.50	14
National	SC120	3.83	3.67	3.17	3.67	14.33	12
Kosrae	SC120	3.33	4.33	3.00	4.00	14.67	3
Yap	SC120	4.00	4.50	3.75	3.75	16.00	4
	Average	3.89	4.05	3.38	3.64	14.95	61



Scientific Procedures and Reasoning: The overall total average in this area is 3.89. Kosrae students in Physical Science averaged the highest with 5 on scientific procedures and reasoning. Chuuk students in Tropical Environments and Yap students in Biology both averaged 4. National campus students all averaged about the same in this area with those in Physical Science averaging 3.9, Biology students 3.83, and Zoology students 3.79. Students from Pohnpei campus in Tropical Environments averaged 3.43, while Kosrae Biology students averaged only 3.33. **Strategies:** The overall total average in strategies is 4.05. Kosrae Physical Science students averaged the highest on strategies with a score of 5.6. Yap Biology students were next with an average of 4.5. Kosrae Biology students averaged 4.33 which is still above the total average of 4.05. The remaining groups scored below 4.05 with National campus Physical Science students and Zoology students both averaging 4, Pohnpei Tropical Environment students averaging 3.86, National campus Biology students averaging 3.67, and Chuuk Tropical Environment students averaging 3.5. **Scientific Communication using Data:** The overall average for this criteria was 3.38. Kosrae Physical Science students averaged 4.4, Yap Biology students averaged 3.75, Chuuk Tropical Environment students averaged 3.5, and National campus Zoology students averaged 3.43. The remaining groups fell below the total average. National campus Physical Science students averaged 3.3, National campus Biology students 3.17, Kosrae Biology students averaged 3, while Pohnpei campus Tropical Environment students averaged 2.86. **Scientific Concepts and Related Content:** The overall total average in this area is 3.64. Kosrae students in both Physical Science and Biology had the highest averages with 4.4 and 4 respectively. National campus Physical Science students averaged 3.9, Yap campus

Biology students averaged 3.75, and National campus Biology students averaged 3.67. Chuuk campus Tropical Environment students, average 3.5, and National campus Zoology students and Pohpnei campus Tropical Environment students, average 3.29, fell below the overall total average.

Science St Dev

Campus	Course No	Sc Proc & Reasoning	Strategies	Sc Comm/Using Data	Sc Concepts & Related Content	Total
Chuuk	SC117	1.26	1.38	1.05	0.84	3.99
Pohnpei	SC117	0.79	0.69	0.69	0.95	2.82
Kosrae	SC130	0.00	0.55	0.55	0.55	0.55
National	SC 130	0.32	0.47	0.82	1.29	2.51
National	SC255	0.58	0.39	0.94	0.83	1.95
National	SC120	0.72	0.78	0.72	0.89	2.61
Kosrae	SC120	0.58	0.58	0.00	0.00	0.58
Yap	SC120	1.15	1.00	0.96	0.96	3.56

Distribution of Scores from Criteria on the Rubric: Kosrae students generally scored about the same in all criteria on the rubric used to evaluate the science lab reports. Chuuk students had the highest range of scores followed by Yap students. Students in SC 117 at Pohnpei campus, SC 120 and SC 130 at National campus also had a moderate distribution of scores on the criteria evaluated on the rubric. Students in SC 255, which is usually a second lab science for students, begin to show a smaller distribution of scores, but not like those of the Kosrae students.

Confidence in Assignment Completion: Students turning in lab reports were also asked to rate how confident they felt in completing the assignment. 50 students responded to this question on the cover page. 10 students were not given the cover page to complete and one of the reports in the selection was so off topic that it was not counted in the data. Of the 50 students responding, 25 felt very confident in their work. 8 students stated they felt mostly confident and 9 students said they were confused, very unsure or nervous about the assignment. The ratings indicate that very few of the students were given ratings over 4 which is like 50% since the total score on any given criteria was 8.

Conclusions:

Overall, the ratings tended to be low in all criteria assessed. One instructor expressed the concern of using different lab sciences and comparing them together. However, the rubric was

designed to assess any lab report with the criteria being general enough that any lab report should include scientifice procedures and reasoning (formulating a hypothesis), methodology, collecting data and being able to report it in an understandable format, and drawing conclusions. For many students, the lab science is the only lab science course they will take at the College. Students probably don't have enough experience writing scientific lab reports.

Recommendations:

1. Students should write more than one – three lab reports a semester. Each lab science is required to meet in lab 15 times a semester.
2. Faculty may need training on how to get students ready to write scientific reports.
3. Science faculty expectations of students should be communicated to Languages and Literature/ English division for more collaboration between expository writing and scientific writing.

Appendix B

- Lab Science assignment
- Cover page
- Instructions
- Grading Rubric

COMMON SCIENCE ASSESSMENT
SC 120, SC 130, SC 117
Student Page

Your teacher has asked you to do a lab experiment for your work in this class. For this assignment, please write a lab report (1.5 – 2 pages).

As you draft your report, please follow these directions:

1. Follow the standard format provided by your instructor. This should at least include sections such as materials and/or equipment needed, procedures, data collected and conclusions.

2. Include any graphs, charts, tables or diagrams as necessary.

3. Check to make sure that your report demonstrates that you understand scientific concepts and to communicate data.

4. Prepare the paper following these directions:
   - Type the report using size 12 font, double space and 1 inch margines.
   - Use the spell-checker and proofread before you save your final draft.
   - Print two copies of the report. Give them each to your instructor.

COMMON SCIENCE ASSIGNMENT RECORD

COM-FSM ID number _____ Course name _____

1) Check which campus your were attending when completing this assignment:

_____Kosrae St. Campus _____Pohnpei St. Campus

_____National Campus _____Chuuk St. Campus

_____Yap St. Campus _____FMI Campus

2) What did you like or dislike most about this assignment?

_____

_____

_____

3) How confident are you in writing this lab report? _____

Thank you for helping with our research into ways of improving our programs.

* * * * *

1st reader: Circle holistic score for scientific reasoning: 4 3 2 1 0

Then check boxes for analytical results:

Score	Scientific Procedures and Reasoning	Strategies	Scientific communication/using data	Scientific concepts and related content
4 Superior				
3 Proficient				
2 Essential				
1 In progress				

2nd reader: Circle holistic score for scientific reasoning: 4 3 2 1 0

Score	Scientific Procedures and Reasoning	Strategies	Scientific communication/using data	Scientific concepts and related content
4 Superior				
3 Proficient				
2 Essential				
1 In progress				

3rd reader: Circle holistic score for scientific reasoning: 4 3 2 1 0

Score	Scientific Procedures and Reasoning	Strategies	Scientific communication/using data	Scientific concepts and related content
4 Superior				
3 Proficient				
2 Essential				
1 In progress				

NOTES TO PARTICIPATING TEACHERS

The purpose of this assessment is to measure our students' scientific reasoning skills on our various campuses. What we learn will help us to reach consistency among campuses. We are collecting results with no interest in identifying individual students, classes or instructors. We are looking at patterns.

The method is to ask instructors to embed the attached common assignment into a science lab sometime towards the end of the semester, but before November 25, 2009, and contribute to the ongoing work. Instructors are asked to have students write one lab report from any lab experiment during the semester. Instructors will differ in the ways they use the lab write-up for grading or instruction, but they will select a second copy of the paper, this one anonymous, for submission to the assessment team. The notes below describe the process in more detail.

- Distribute to each student a copy of COMMON SCIENCE ASSIGNMENT package in the SC 120, SC 130, and SC 117 classes.
- Give student the one week to complete the handout. Please go over the directions with the students to be sure they understand the assignment.
- Do not provide comments on first drafts or assign revisions as a formal activity before the samples are submitted. This is to level the field so that all students are relying on their usual writing and thinking processes. If they are in the habit of getting help from tutors or friends and revising their own, that is fine, but do not make it a scheduled class activity until after the anonymous sample has been submitted to the assessment team.
- Each student should give you two copies of his or her paper. One is for you to grade or continue to work on as a regular class assignment. The other is for you to set aside for the assessment project. Make sure students used their COM ID numbers on the assignment sent to the assessment project.

Thank you for participating in the project.

General education laboratory science Rubric

Performance factor score			
4	3	2	1
Metric: Scientific Procedures and reasoning			
Accurately and efficiently used all appropriate tools and technologies to gather and analyze data	Effectively used some appropriate tools and technologies to gather and analyze data with only minor errors	Attempted to use appropriate tools and technologies but information inaccurate or incomplete	Inappropriate use of tools or technology to gather data
Metric: Strategies			
Used a sophisticated strategy and revised strategy where appropriate to complete the task; employed refined and complex reasoning and demonstrated understanding of cause and effect; applied scientific method accurately	Used a strategy that led to completion while recording all data; used effective scientific reasoning; framed or used testable questions, conducted experiment, and supported results with data	Used a strategy that led to partial completion of the task/ investigation; some evidence of scientific reasoning used; attempted but could not completely carry out testing, recording all data and stating conclusions	No evidence of procedure or scientific reasoning used; so many errors, task could not be completed
Metric: Scientific communication/using data			
Provided clear, effective explanation detailing how the task was carried out; precisely and appropriately used multiple scientific representations and notations to organize and display information; interpretation of data supported conclusions and raised new questions or was applied to new contexts; disagreements with data resolved when appropriate	Presented a clear explanation; effectively used scientific representations and notations to organize and display information; appropriately used data to support conclusions	Incomplete explanation; attempted to use appropriate scientific representations and notations, but were incomplete; conclusions not supported or were only partly supported by data	Explanation could not be understood; inappropriate use of scientific notation; conclusion unstated or data unrecorded
Metric: Scientific concepts and related content			
Precisely and appropriately used scientific terminology; provided evidence of in-depth, sophisticated understanding of relevant scientific concepts, principles or theories; revised prior misconceptions when appropriate; observable characteristics and properties of objects, organisms, and/or materials used when beyond the task investigation to make other connections or extend thinking	Appropriately used scientific terminology; provided evidence of understanding of relevant scientific concepts, principles or theories; evidence of understanding observable characteristics and properties of objects, organisms, and/or materials used	Used some relevant scientific terminology; minimal reference to relevant scientific concepts, principles or theories; evidence of understanding observable characteristics and properties of objects, organisms, and/or materials used	Inappropriate use of scientific terminology; inappropriate references to scientific concepts, principles or theories

Source: http://www.mckendree.edu/academics/Scientific_Exploration_Rubric.aspx