William Paterson University
College of Science and Health - Department of Computer Science

Fall 2013 – Spring 2015 Assessment Cycle
Analysis of the Program's Student Outcome Assessment Data

Program's Student Outcome: S5:

Demonstrate abilities to locate and make effective use of information.

ABET's Related Student Outcomes (h)

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A. Analysis of the Assessment Data

For the assessment period Fall 2013 to Spring 2015, this student outcome was assessed in the following four courses: CS3450, CS38200, and CS4800.

In CS 3450 in Fall 2013, we see a near uniform distribution in the upper three categories, with just 1 student in the "Some Ability" case. In Spring 2014, we see a near uniform distribution but with a slight bulge in the "Some Ability" case. So the trend varies depending on class composition. Homework is often a strong measure of a student's dedication and seriousness. While an occasional strong student might not do most homeworks (due to lack of interest or challenge), that is rare. More often weaker students lacking motivation will tend to skimp on the homeworks. This is a general observation. On the very positive class composition, we observe Fall 2014 and even more so Spring 2015 (very strong cohort of students, the honors students motivating the others) had very robust statistics on homework, internet inquiry, and information collection and compilation into effective documents.

In CS 3820, Internet usage and information collection occurs more in the second half of the course. The first half of Programming Languages is standard Lexical, Syntactic, and Semantic Analysis. The second half, with the language characteristics and types of languages, induces exploration into the varied spectrum of languages such as Java, Python, Ruby, PHP… That is when inquiry adopts a enriching professional growth characteristic.

In Fall 2013, the distribution had all students showing at least Adequate Ability, with a bimodal upper-end. In Spring 2014, we had half the students in the categories "More than Adequate Ability" and "High Ability", again none below Adequate.

In Fall 2014, we added a stress on Internet hunt and information collection, first just to promote inquiry in the homeworks. Secondly, we added an initial demographics of programming languages and history timelines of languages. Besides the standard explore other languages, the foremost reason was because we used Scott's text instead of Sebesta. Sebesta promotes much less inquiry. Scott has many exercises (spilling over on to CD) and easily covers double the material of Scott, some requiring Internet help as support

material (many links were provided to students each week). So the Fall 2014 statistics had 80% in the "More than Adequate Ability" and "High Ability".
Since Scott's book is just too rigorous and tough, we went back to Sebesta in Spring 2015. Results are the roughly 50% Adequate, none below, and 50% above
(specifically: 0 % Below, 53.9 % Adequate, 23.1 % More, 23.1 % High).

As CS 4800 is a Capstone Seminar course with very current information required and inquiry/research as a standard goal, Internet hunts are a necessity and frequently conducted in it.
In Fall 2013, we observe 85% at 'More than Adequate Ability' and 'High Ability'.

In Fall 2014, we see a uniform distribution. The cause: the library was used as the primary model for accessing papers. This narrower usage as a source of reference material and with physical libraries probably had stifling effect on students. Even the lowest category was nearly a quarter of the population. Students prefer the Internet.
Faculty appreciate libraries far more than students; this is the age of technology.

Spring 2015 sees a shift back up to roughly 80% at 'More than Adequate Ability' and 'High Ability'. No mention of stressing library over Internet.

B. Suggestions for Improvement

In CS 3450, the key to heavier Internet and general information collection is in the homeworks.
Students find the modern and varied information on the Internet particularly useful in Operating Systems.
In class work and exams in class require much subject matter and study with little time on the Internet.
Operating Systems has much required material using up most of class time; homework assignments for hunting the Internet are the only effective way to promote OS inquiry.

In CS 3820, the suggestion is to have a book with more challenge to promote inquiry with a richer context, more rigorous problem sets, and a need for alternate sources for pedagogical support. Students will hunt when they need too.

In CS 4800, students can access all the literature (papers included) off the Internet. That is their style of learning. The classical waltz to the library is antiquated to them. Faculty enjoy libraries but students live in a different world.
As a secondary suggestion which reaches a compromise, have the library order more E-books and E-journals. While the same material, it is more easily accessed and fits the current social trends.

C. Improvement Implemented

The above suggestions have been implemented in Fall 2016.

D. List all the "performance level/frequency/percentage" tables and their sources.

a. Faculty Course Assessment Report: CS 3450, Fall 2013

Data Collected: Each student's level of performance on locating and making effective use of information

Method of Collection: Each student is required to locate information about an OS topic and to make an oral presentation and to produce a report on it. He/she then receives a letter grade on the contents and knowledge of the topic presented (from every student in the class) and a letter grade on his/her report from the instructor of the course.

Performance Levels	Frequency	Percentage
Some Ability	1	5%
Adequate Ability	7	33%
More than Adequate Ability	6	29%
High Ability	7	33%

Observations: Students were asked to write an OS topic not covered in classroom. Furthermore, they are required to locate and make use of information beyond the textbook in the written report. Almost all have demonstrated their ability to locate and make effective use of information.

b. Faculty Course Assessment Report : CS3450, Spring 2014

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection:
Several homework assignments require students to locate information from the Internet as well as other sources. For examples, my questions on RAID go well beyond the book's coverage. Each student is required to locate information aspects of the systems that may fall outside the text.

Performance Levels	Frequency	Percentage
Some Ability	7	33%
Adequate Ability	5	24%
More than Adequate Ability	4	19%
High Ability	5	24%

Observations: Students did uniformly across the board here in spread with a slight bulge on the low end. Most of the students are capable of finding information well. However, homework is hard work and students may resist doing a homework just on the basis of effort / expectations. Based on this realization, I may need to develop a more effective metric which discerns actual inquiry, search, and information filtering from the resistance to do homework. I may need to distinguish information search homework more distinctly than illustrated in the present assignments, so it can become a more significant metric here.

The homework completion rate is nearly 2/3^{rds} (two thirds) adequate to excellent. When I taught the course, I was focused more on subject matter, knowledge in the OS domain, and treated the information-location aspect as secondary. I will need to provide more challenge and exercises in this respect (i.e. Internet usage). The results may be even more positive than the above as I have observed informally that students are very adept at internet based information location and providing the results in a well structured and concise manner in addressing questions/problems. Increasing the homework delivery statistics will prove a challenge (hence room for improvement).

c. Faculty Course Assessment Report: CS3450, Fall 2014

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each student is required to make an oral presentation and to produce a report on one of the following OS topics: Virtualization and the Cloud, Multiple Processor Systems, Security, UNIX, LINUX, and Android, Windows 8, and Operating System Design. He/she then receives a numerical grade on his/her presentation (from every student in the class) and a numerical grade on his/her report from the instructor of the course.

Performance Levels	Frequency	Percentage
Some Ability	1	10.0 %
Adequate Ability	1	10.0 %
More than Adequate Ability	6	60.0 %
High Ability	2	20.0 %

Observations: There were four groups of two students and two of one student. Students who worked in groups did much better with their reports.

d. Faculty Course Assessment Report: CS3450, Spring 2015

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection:
Several homework assignments require students to locate information from the Internet as well as other sources. For examples, my questions on RAID go well beyond the book's coverage. Each student is required to locate information aspects of the systems that may fall outside the text.

Performance Levels	Frequency	Percentage
Some Ability	1	5.55%
Adequate Ability	1	5.55%
More than Adequate Ability	3	16.67%
High Ability	13	72.00%

Observations: Students did very well here, with the majority on the high end. Most of the students are capable of finding information effectively and utilizing their findings in decision making, critical thinking, and formulating coherent theories and conclusions. Part of the success is developing relevant questions, ones that matter to students and would be relevant to them, their interests, their perceptions, and their careers. Almost all of computer technology now revolves around or at least depends upon an operating systems foundation. It is the basic platform of most computation.
The homework productivity is nearly 3/4 (three quarters) excellent. The recitations and practice sessions had many hands-on activities; drilling was constant and heavy-duty, promoting student inquiry, self-reliance, and being opinionated in a positive sense. Still, I would like to add more challenging exercises in this respect (i.e. Internet usage). The results may be even greater than the above, as I have observed informally that students are very adept at internet based information location and providing the results in a well structured and concise manner in addressing questions/problems. Increasing the homework delivery statistics will prove a challenge (hence room for improvement) but the problem now is the weakest quartile of students. They are harder to reach.

e. Faculty Course Assessment Report: CS3820, Fall 2013

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each student is required to locate information about a programming language that is not taught in the program and to make an oral presentation and to produce a report on it. He/she then receives a numerical grade on his knowledge of the features of that programming language (from every student in the class) and a numerical grade on his/her report from the instructor of the course.

Performance Levels	Frequency	Percentage
Some Ability	0	0 %
Adequate Ability	3	37.50 %
More than Adequate Ability	2	25 %
High Ability	3	37.50 %

Observations: Students in this class were very motivated to learn a new programming language and this motivation was evidenced by the high quality of their reports and presentations. After a programming language feature was discussed in class, they used the web to find out how it was implemented in their chosen programming language.

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f. Faculty Course Assessment Report : CS3820, Spring 2014

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each student is required to locate information about a programming language that is not taught in the program and to make an oral presentation and to produce a report on it. He/she then receives a numerical grade on his knowledge of the features of that programming language (from every student in the class) and a numerical grade on his/her report from the instructor of the course.

Performance Levels	Frequency	Percentage
Some Ability	0	0 %
Adequate Ability	7	53.9 %
More than Adequate Ability	3	23.1 %
High Ability	3	23.1 %

Observations: Only about half of the students in this class were very motivated and enthusiastic about their projects and this motivation and enthusiasm were reflected in the quality of their project reports.

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g. Faculty Course Assessment Report: CS3820, Fall 2014

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each homework assignment makes extensive use of the Internet. Go to the portal page:
http://cs.wpunj.edu/~najarian/cs382/cs382_2014_fall_course_material/ and observe/confirm that this is true.
As an example even from day 1, the first homework project directly uses several websites for students to study, determine, and classify categories of languages (partitioned along different characteristics),
language popularity/prevalence/predominance, and the historical timelines / evolution of language groups.
Progressively, more intensive and inquiry based searches were expected as the homeworks progressed.
They required students to locate information on programming languages, access compilers/IDE's, install them, and use them in programming activities. Even the textbook required students to find additional information and chapters on the online CD. Most of the deeper non-review homework problems in the text require exploring the Internet for information, understanding it, and integrate it into problem solution. Hence, we use the homework metric as the best measure.

Performance Levels	Frequency	Percentage
Some Ability	1	4%
Adequate Ability	4	17%
More than Adequate Ability	9	38%
High Ability	10	42%

Observations: Student did very well, with approximately 2/5 A level work, 2/5 B level, and only 1/5 C level. This is consistent with student abilities; this is the Internet generation! Even many epic and popular papers in the literature in Programming Languages are on the Web as PDF's and Postscript files.

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h. Faculty Course Assessment Report: CS3820, Spring 2015

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each student is required to locate information about a programming language that is not taught in the program and to make an oral presentation and to produce a report on it. He/she then receives a numerical grade on his knowledge of the features of that programming language (from every student in the class) and a numerical grade on his/her report from the instructor of the course.

Performance Levels	Frequency	Percentage
Some Ability	0	0 %
Adequate Ability	7	53.9 %
More than Adequate Ability	3	23.1 %
High Ability	3	23.1 %

Observations: Only about half of the students in this class were very motivated and enthusiastic about their projects and this motivation and enthusiasm were reflected in the quality of their project reports.

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i. Faculty Course Assessment Report: CS 4800, Fall 2013

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each student was required to make a 30-20 minute oral presentation on a research topic of his own choosing. The student then has to write a 5 to 10 page paper on his research topic. I only coached their efforts; they did the hunting/gathering and compilation of information into their work while I was just observing, gauging progress, and grading results.

Performance Levels	Frequency	Percentage
Some Ability	1	5 %
Adequate Ability	2	9 %
More than Adequate Ability	13	59 %
High Ability	6	27 %

Observations: Some of the reports were comprehensive and detailed. Others were more like journals of activities and more informal. These topics were interests of the student speakers and writers, resulting in unanticipated energy and enthusiasm. The topics included:

- Steganography: security through obscurity
- Creating a simple website using PHP and MySQL, and generating content dynamically
- Cloud Computing: Principles. Design, Configuration, and Deployment in a Modern Business Context
- iPhone Development with Probability Toolbox
- Online database support for Flash-format video retireval, query, and Web-based download.
- Remote Sensor Networks: Securely Interfacing the World
- Project Avoidance In Symmetric Groups: Problem k = 4
- Creating an animated file using Perl
- PHP & MySQL Web-based Database Development for Dynamic Graphical Webpage/Site Design
- Versatile Game Programing

- C++ Chat room with client/server architecture using Windows Sockets API
- SONIC THE HEDGEHOG: Re-imagined, Reinvented, and Still Blue.
- Two Player Tankwars: Game programming with Vectors and Bitmaps in Allegro C++
- Programming & Video Website written using PHP and MySQL.
- Interactive Android OS accelerometer and graphics application built using Google/MIT App Creator.

This wide spectrum of topics reflects engaged, students researching varied resources online, in the library, and other sources outside the classroom. Students were required to do so but did not need my edict as they did so extensively of their own volition and with zeal.

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j. Faculty Course Assessment Report: CS 4800, Fall 2014

Data Collected: Each student's level of performance on locating and making effective use of information

Method of Collection: Each student was required to complete different research papers on the latest technological development. They also submitted their own research proposal and final research paper. They were required to find different sources for their papers. They were also required to cite other's work properly.

Performance Levels	Frequency	Percentage
Some Ability	3	21.5 %
Adequate Ability	3	21.5 %
More than Adequate Ability	4	28.5 %
High Ability	4	28.5 %

Observations: Some of the reports were very good. The students were taken to the library and the librarian showed them how to locate information using our library too. They were also introduced to the citations techniques. Some of them done excellent jobs. Overall, it is found that the students like to do hands on tasks compared to the scientific writing.

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k. Faculty Course Assessment Report: CS 4800, Spring 2015

Data Collected: Each student's level of performance on locating and making effective use of information.

Method of Collection: Each student was required to conduct/write a literature review and make a 10-15 minute oral presentation on a security or privacy related research topic. Students were given lectures on how to locate academic research information from online libraries and scholar.google.com. The students were also instructed on how to select good references based on the importance/contribution of research measured by the citation count and publication outlet (i.e.,

top journal/conference). The student then had to write a 4 to 5 page paper based on the literature review to identify gaps in the research and potential research directions. Results from the literature review were then presented to the class. The presentations were graded by the professor on knowledge, content, organization, and style.

Performance Levels	Frequency	Percentage
Some Ability	0	0 %
Adequate Ability	2	18 %
More than Adequate Ability	5	46 %
High Ability	4	36 %

Observations: Some of the reports were very high quality. Since students were allowed to choose their own topic in security or privacy it was easier to get students interested and engaged compared to when the topics were assigned. The closer the topics were to the interests of the speaker, the better the research paper and presentation. The topics included security in cloud computing, the implementation of a photo geo-tagging system, using hidden Markov models to identify optimal routes and a statistical model of behavioral security.