

# *Affordable Learning Implementation*

## **Grant Report**

### **CHEM 570: Advanced Analytical Chemistry (Fall 2022)**

#### **Gerard G. Dumancas, Chemistry**

Last Fall 2022, I taught CHEM 570 *Advanced Analytical Chemistry* using the PowerPoint slides that I originally developed and adapted using the following multiple open educational resource (OER) materials:

- [Dumancas, G.G., Allen, J. Analytical Chemistry Lecture, 2021, Louisiana State University at Alexandria.](#)
- [Harvey, D. Analytical Chemistry 2.1 , 2016, DePauw University](#)
- [LibreTexts, Analytical Chemistry, 2019](#)

The primary OER that I used for the development of the approximately twenty chapters of PowerPoint Slides was from the original one that I developed from scratch when I was at Louisiana State University at Alexandria (LSUA) ([Dumancas, G.G., Allen, J. Analytical Chemistry Lecture, 2021, Louisiana State University at Alexandria.](#)). CHEM 570 is a graduate level analytical chemistry course with 11 students enrolled last Fall 2022. The course spans a wide array of topics ranging from classical statistical tests to the theories and instrumentation behind some of the state-of-the-art techniques used to analyze substances in different sample matrices. I believe that my developed materials captured all aspects of the course that could, otherwise, be only made possible by purchasing the textbook by [Skoog, D. A., Holler, F. J., Nieman, T. A., titled 'Principles of Instrumental Analysis, 7th ed.'](#) The aforementioned textbook costs \$185.95 which can be substantial for a full time graduate student dependent only on a salary as a teaching or research assistant at the university. *The costs could have been greater since bookstores typically sell the textbook at \$400.00 price.* The main goal of my developed materials is to provide the students the necessary training and background on the theories and uses of various advanced instruments commonly found in industries and research laboratories including their operating principles as well as its optimal area of applications. Further, the materials also allowed the students to be immersed in various classical and advanced statistical tests frequently used in analytical chemistry research. Overall, the development of my OER materials generated ***cost savings of \$2,231.40*** for my CHEM 570 class last Fall 2022 semester.

#### ***How I perceived students engaging with the OER materials***

Prior to the start of the Fall 2022 semester, I provided my students instructions that there is no need to purchase the commonly used textbook by Skoog et al and that I will be providing my own developed PowerPoint slides based on adaption from various OER resources as mentioned earlier. I provided my students the necessary syllabus with the list of OER materials including the PowerPoint slides that I developed in D2L Brightspace. During the middle and the end of the Fall Semester, I also collated feedback from my students on what they think of the OER materials and majority of them (10/11) were pleased of using these instead of buying the textbook. The most common perception was that the materials provided them with all the information needed in preparation for their exams. They also noted how informative the PowerPoint slides were and that they did not need to look elsewhere to prepare for the tests. Furthermore, the students also enjoyed the class and that they can tie the information back to their laboratory experiments. The material is difficult but the OERs tremendously assisted the students and that these students felt that I really wanted to make them succeed in the course.

I have summarized the survey of my students at the end of Fall 2022 semester and overall, I am pleased with the results.

#### Question 1

What year level are you in?

freshmen		0	(0 %)
sophomore		0	(0 %)
junior		0	(0 %)
senior		0	(0 %)
graduate - year 1		9	(81.82 %)
graduate - year 2		2	(18.18 %)

#### Question 2

What is your current major?

biochemistry		11	(100 %)
chemistry		0	(0 %)
medical laboratory science		0	(0 %)
biology		0	(0 %)
math		0	(0 %)
physics		0	(0 %)
others		0	(0 %)

#### Question 3

Why are you taking this course?

a requirement for my major		11	(100 %)
minoring in chemistry		0	(0 %)
elective		0	(0 %)
others		0	(0 %)

#### Question 4

How useful are the open educational resource (OER) materials provided for this course? OER refers to all free educational materials used in this course.

very helpful		5	(45.45 %)
helpful		5	(45.45 %)
not helpful		1	(9.09 %)

#### Question 5

To what extent did the OERs prepare you for the exams?

it prepared me very well		2	(18.18 %)
it prepared me very well but also in combination with quizzes		8	(72.73 %)
it did not prepare me at all		1	(9.09 %)

#### Question 6

I feel like the OERs in google drive were worth it rather than spending \$400 to buy for a textbook

yes		9	(81.82 %)
no		0	(0 %)
not sure		2	(18.18 %)

#### Question 7

I would recommend retaining the OERs for this class.

yes		10	(90.91 %)
no		1	(9.09 %)

#### Question 8

The OERs helped me in having a better understanding of this course.

yes		9	(81.82 %)
no		2	(18.18 %)

### ***Future OER plans***

I will continue using my developed OER materials wherein I am scheduled to teach the same course again for the Fall 2023 semester. It is a very challenging course to teach since the concepts involved are complex and in a high level of discussion. I will continue to evaluate and further refine my developed OER materials. Evaluation will be based on what my students perceive of the OERs I provided in the course. As developments in my field arise, I will also update the content of my developed OERs. I spent a great amount of work in these materials, and they are very informative and detailed. As such, I may consider trying to downsize the number of slides to only capture the necessary information needed for the course. In addition to these OERs, I also implemented the use of game learning technologies such as ‘Kahoot!’, ‘Slido,’ and ‘Quizizz’ in my classes. The use of these technologies further strengthened student engagement and I am overall pleased with these results. I may consider implementing other OERs in my other courses but depending on my time availability, I will assess if this plan would be feasible.

### ***Additional OERs discovered***

There are other additional resources that I may be using as I further refine my CHEM 570 course. In the future, I may consider using various published open access articles so students will be kept abreast with the current developments in the analytical chemistry field. Other OERs that I may consider for the abovementioned course include the [Makinwa’s Electronic Instrumentation](#), as well as [Makokha’s Separation, Electroanalytical, and Spectrochemical Techniques](#).

### ***General feedback on OERs and experience***

I found the use of my developed materials to be ***challenging but rewarding***. It is challenging since it requires a great amount of time and effort to collate other existing OER materials. However, I consider it to be very rewarding since I am able to provide free educational resources to the students without putting their learning to a disadvantage. Based on the feedback provided by my students, I will continue to use my developed OERs in the succeeding semesters for this course. Since analytical chemistry is a rapidly dynamic field, I will also be vigilant to the advances in my field to ensure that updates in my OERs are reflected.