

An Intriguing Perspective on CHEM 121 Classroom Caps
and Student Withdrawals
on The Carson City Campus of Western Nevada College:

An Inclusive 15 Semesters' Overview Between Spring
2012 and Spring 2019 CHEM 121 Courses

by

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Abstract/Executive Summary

CHEM 121 courses offered between (inclusively) Spring 2012-Spring 2019 in REYN 103 (66 student cap), CED 310 (30 student cap; formerly CED 313), CED 305 (36 student cap; formerly CED 306) and the newly remodeled William N. Pennington Biophysical Sciences Laboratory (ASP 201; 32 student cap) were examined for withdrawal patterns. REYN 103 (largest classroom in this review) had the greatest number of student withdrawals ($p \lll 0.001$) relative to the other three classrooms/labs while CED 310 (smallest classroom in this review) had the least number of student withdrawals ($p \lll 0.001$, < 0.01 and < 0.01 , respectively). Furthermore, based on the data, it appears that the raw number of student withdrawals may be predicted with some degree of accuracy ($R^2 = 0.9815$) by knowing the room student cap (as set forth by the State Fire Marshall and related Codes; i.e., not the actual student enrollment/headcount) in advance. Possible retention solutions are discussed in the text of the review.

Flesch-Kincaid = 14; 157 words

Introduction

Between Spring 2012 and Fall 2013, student withdrawals were observed to have been substantially higher when students were enrolled in REYN 103 than when they were enrolled in CHEM 121 in CED 310 (old number was CED 313 – WNC re-numbered the third floor of CED in Spring of 2019 to catch missed, out-of-sequence, numbers). At that time, specific requests were submitted for future CHEM 121 courses to be scheduled in CED 310. That lasted for two additional semesters when faculty were asked to increase their class sizes to help the college along, administratively.

One semester returning to teach in REYN 103 confirmed that it had too much space and a compromise classroom (CED 305) was agreed upon for CHEM 121 lecture scheduling. While student withdrawals weren't quite as rampant as they were from REYN 103, they were clearly not as low as they had been in CED 310.

In Fall 2016, the College was notified that it had received a \$3.44M grant from the William N. Pennington Foundation to remodel, and enlarge, the BIOL/CHEM lab in the Aspen Building (ASP 201), to include a larger, stand alone cadaver lab as well as a prep/storage room; and to increase the enrollment capacity (student room cap) from 24 students to 32 students.

During Spring 2017, the old 201 ASP was stripped down as much as possible without impeding student lab activities and experiments. In August/September 2018, the demolition became serious with a temporary move of minimally required CHEM 121 supplies into the old BIOL lab (329 BRIS; currently undergoing its own move and re-model at this writing).

Through Fall 2017, CHEM 121 lectures continued to be held in CED 305. The newly re-modeled William N. Pennington Biophysical Sciences and Human Cadaver Facilities were occupied beginning Spring 2018, teaching lectures and holding laboratory experiments; playing catch-up and re-stocking on a severely limited budget, concurrently.

Since student withdrawals have not been examined since about Fall 2013, it was deemed important to review what's been going on in terms of student withdrawals in light of the ongoing (continuing) emphases on student retention. To that end this review is written.

Methods

All student withdrawal data, as well as room use data, was taken manually from myWNC and focuses only on the author's students. The data does not include students who completed an "even-exchange".

Students' Two-Tailed T-Test for Significance was used to compare groups. A standard probability of less than 0.05 ($p < 0.05$) was established as the minimum necessary upper limit to determine statistical significance.

Microsoft Excel was utilized for graphic representations, as well as for statistical calculations/analyses.

Results

Figure 1, below, illustrates enrollment by pre-nursing or gen ed student, total course enrollment, as well as student withdrawals, by classroom in the Carson City Campus between Spring 2012 and Spring 2019.

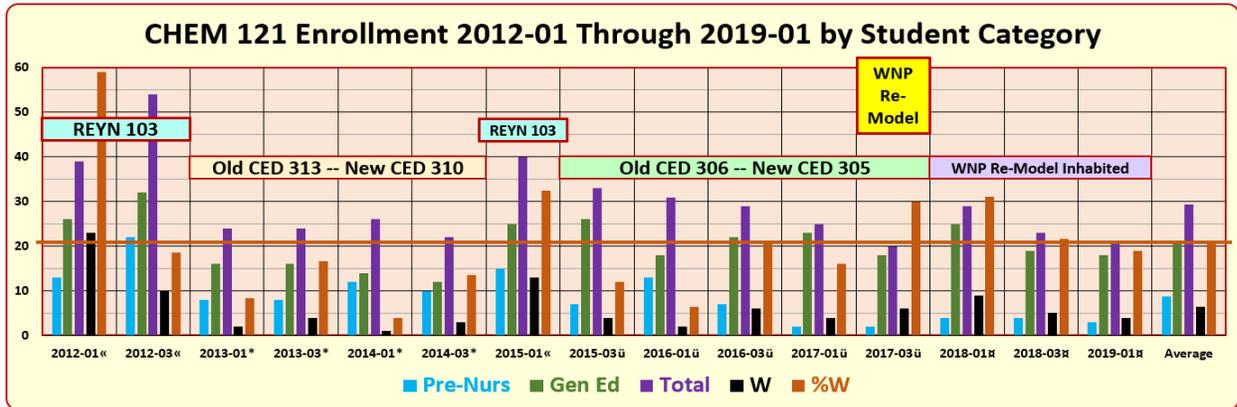


Figure 1. Student enrollment and withdrawals by classroom on Carson City Campus of WNC.

Figure 2, right, illustrates the relationship between room cap, raw numbers of students withdrawing from CHEM 121, the percent of students withdrawing on average and the ratio of the raw students withdrawing to the classroom cap:

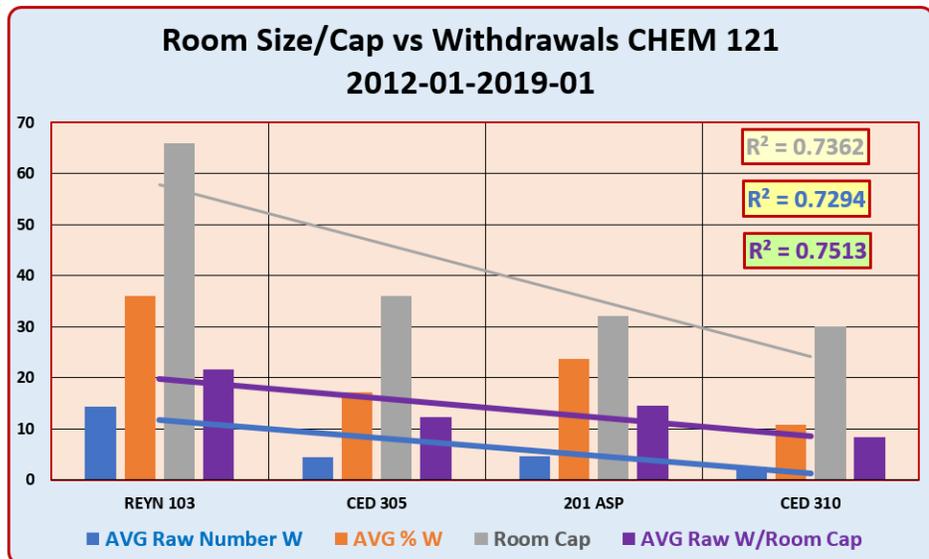


Figure 2. Student Withdrawals by Classroom [Cap].

Figure 3, below, illustrates the relationship between classroom student cap and the average raw number of students who withdrew from CHEM 121 across the 15 semesters for this review:

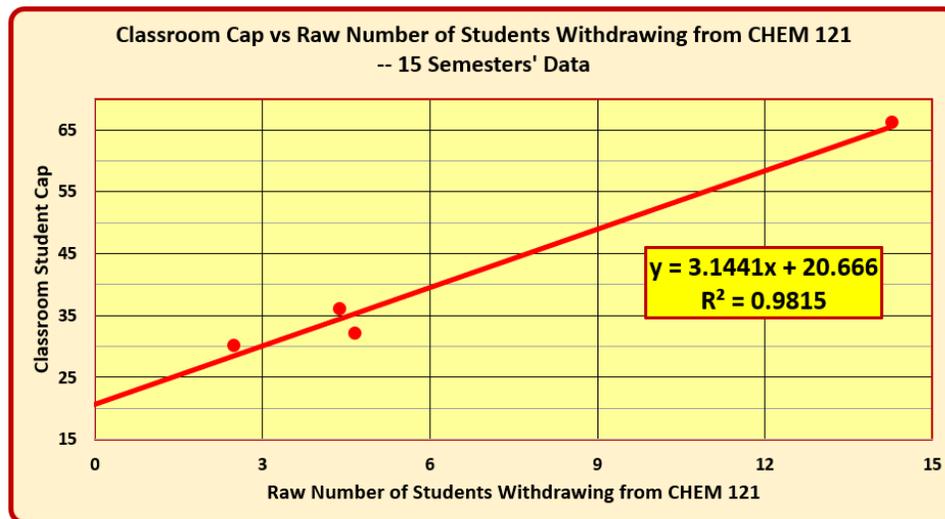


Figure 3. Classroom Student Cap vs the Raw Number of Students Withdrawing from CHEM 121.

Discussion, Conclusions and Future Recommendations

Figure 1 illustrates very nicely the detailed effects of the room cap on student withdrawals from CHEM 121 (the horizontal orange line across **Figure 1** represents the average per cent of students withdrawing from CHEM 121 across all rooms and across all 15 semesters). Likewise, it clearly shows the reduction of pre-Nursing students taking CHEM 121 as their pre-requisite for the succeeding Biology courses (223, 224 and 251); the reduction clearly “troughs” (“tanks”???) about the time that BIOL 190 became the “gold standard” pre-requisite for the following Biology courses (223, 224 and 251, ca Fall 2016-Spring 2017). The troughing further supports removing CHEM 121 as a Biology course pre-requisite as previously 1) reported upon, 2) submitted through the current Interim Liberal Arts [and Sciences] Director and Interim VPASA (*per emails 2 May 2019 and 22 May 2019; non sequitur, albeit related, MATH pre-requisite submitted changes have not been administratively followed up on per emails 4 Apr 2019 and 16 May 2019*) and 3) agreed upon by WNC’s full-time Biology faculty [1].

In addition, observationally, CHEM 121 continues to “hurt” students academically in their quest towards their successful (per WNC’s successful student definition) pre-Nursing course completion, i.e., **there is nothing in CHEM 121** that prepares students for (to support mastery of) the academic content in BIOL 223 or 224 (if they actually progress beyond BIOL 223 into BIOL 224). Indeed, as previously reported, NSBE/Q #8 and ensuing content had substantial issues, did not fit the CHEM 121 content and was, hence, removed from CHEM 121 beginning Spring 2019 [2]. Note should be made that NSBE/Q 8 content removal (as well as spreading out and slowing down the last half of the course content) made no statistically significant difference in students’ final course grade outcome per assessment report currently *in progress* [Tentatively Titled “**A Student-Driven, Evidence- and Data-Based Grading Scale for CHEM 121: Fall 2019 Implementation**”].

Furthermore, a very interesting phenomenon, which requires further obligatory examination/study/inquiry that was likewise “surveilled” over the previous five to seven (5-7) semesters is that of students not faring well in CHEM 121, then following up that poor student performance with the accelerated BIOL 190, 251, 223 and 224 sequence and doing quite well, and, then, returning to complete CHEM remarkably and substantially better, e.g., one student improved/“repaired” his/her grade from a D- to an A- in CHEM 121. The why’s and wherefore’s of this improvement are not readily apparent, however, again, upon careful “in the field” scrutiny, the students appear to have academically matured across their matriculation of the accelerated BIOL courses.

When viewing **Figure 1**, above, it is equally clear that students enrolled in smaller capped rooms, particularly in CED 310, are less likely to withdraw from CHEM 121 than if they are enrolled in any of the other rooms in this review. When determining statistical significance of the withdrawals from the rooms by student cap, **Table 1**, below, is assistive:

Average Raw Student Withdrawal Values by Classroom		
REYN 103 v CED 305	REYN 103 v ASP 201	REYN 103 v CED 310
p <<< 0.001	p <<< 0.001	p <<< 0.001
	ASP 201 v CED 305	CED 305 v CED 310
	NSD	p < 0.01
		ASP 201 v CED 310
		p < 0.01

Table 1. Statistical Examination of Raw Student Withdrawal from CHEM 121 by Room Cap.

While the withdrawal in absolute (raw) numbers between 201 ASP (post-re-model) and CED 305 isn’t entirely unexpected (based upon examination of **Figure 1** and **Table 1**), it is perhaps time to consider a different model of scheduling so as to continue to utilize ASP 201 (William N. Pennington Biophysical Sciences Laboratory) most efficiently/effectively. To that end, CHEM 121 is being coupled with MATH 126 for Fall 2019 and Spring 2020 semesters in the following manner: Dr. Schwartz has agreed to teach MATH 126 MW from 1600-1845 for the first 8 weeks of the semesters and Dr. Carman is offering CHEM 121 Lecture/Lab MW the second 8 weeks of the semesters from 1600-1845/1900-2145 to explore retention from both an academic (learned material) and enrollment (reduced withdrawals) perspective in a combined effort to aid students in being more academically successful. Assessment reports for accelerating CHEM 121 will follow post-Spring 2020 so that complete data for the academic year (2019-2020) is available for a comprehensive review.

Note should be made that to accelerate CHEM 121 requires re-vamping exams, adjusting frequency of exam administration (e.g., weather-related and personal-related issues really tossed a spanner into the works for Spring 2019!, and many lessons were [re-]learned for implementation for Fall 2019), re-vamping homework assignments, adjusting frequency of assignment due dates, teaching style/format alterations, to name but a few variables that require “tweaking”. All of these activities must be accomplished so as to not reduce the rigor of the course vis-à-vis national standards, yet address changing the “aim” of the course from one of “performance” to one of “mastery”, i.e., **Mastery**: Demonstrating continuous improvement towards learning about a fixed body of knowledge; determined, overall, statistically using

Difficulty and Discriminatory Indices embedded in Canvas; **Performance:** Demonstrating on and/or by examination at some degree ranging between the “best” and the “worst” scores. This overall course-aim-re-vamping is addressed by/in a 5 semester, Canvas-stockpiled, CHEM 121 course review/assessment report currently *in progress* [Tentatively Titled “**A Student-Driven, Evidence- and Data-Based Grading Scale for CHEM 121: Fall 2019 Implementation**”].

Note should also be made that there have been institutionally-driven technological delays in initiating several of these changes over the past month (June 2019), hence, delays and “bottlenecks” are to be expected.

While the College emphasizes “... smaller classes ...” [3, “Start Here, Go Anywhere” WNC Main Webpage pop-up message, Accessed 28 June 2019, 1026 hours, PDT]:

 Start Here, Go Anywhere

At Western Nevada College, we're here to help you meet your academic goals in a friendly, supportive campus environment. Western students enjoy strong academic programs, **smaller classes**, and knowledgeable professors who really care.

[View a welcome message from our president.](#)



→ Accessed 29 June 2019, 0951 hours, PDT

the re-model of the lab (ASP 201) emphasized increased enrollments in-line with routine administrative statements to that effect. There is, hence, an incongruence that begs clarification.

Examination of data from the acceleration of CHEM 121 post-Spring 2020 is expected to provide more information for assessment activities on how to proceed with CHEM 121 offerings post-Fall 2020 (this is due to conflicting scheduling “schedules”, i.e., the WNC schedules are set up well in advance of reports of any possible data-based influences that might indicate the need for a more expedited and/or different approach to scheduling).

Figure 2, above, also couples with **Table 1**. Upon scrutinizing the coefficient of multiple determination for multiple regression, it was observed that the values are, for all practical purposes, identical. It was not accepting that the coefficient values were purely coincidental [4; #29] that **Figure 3** was developed. It appears that it may be possible to “predict” how many students will withdraw (this does NOT include “walk-away F’s”, even exchanges or AD’s) from CHEM 121 on the Carson City Campus based upon something as simple as the student room cap (again, using average data from traditional 16 week-long semesters of Spring 2012 through Spring 2019). It will be of post-Spring 2020 assessment interest to follow this “predictability effect” through the acceleration of CHEM 121 in the ensuing academic year to

see if it continues and is reproducible or if it follows the reduced withdrawal patterns of the accelerated BIOL courses.

One might also take into consideration a “break from tradition” (that doesn’t include going online), i.e., if enrollments in CHEM 121 remain in the mid-teens, perhaps one resolution to explore is to offer two (2) sections of CHEM 121 lecture, back-to-back, capped at 16 students per each lecture (and instructed in a classroom capped at less than 20 students) and combine the two lectures in one lab in the Wm. N. Pennington Biophysical Sciences Laboratory as one larger lab. This approach is basically the reverse of what some departments are doing currently, e.g., large sections of BIOL 190 lecture with smaller BIOL 190 lab sections split off.

In overall conclusion, changes to CHEM 121 in Carson City are coming – changes that are purposely intended to be constructive for students and have the students’ best academic interests and best academic success in mind, first and foremost.

Post-script: Dr. Schwartz provided notification 5 August 2019 that the section of MATH 126 that was to precede CHEM 121 has but one (1) student enrolled in it and will likely be cancelled. While disappointing, this fits in with one change already in the works for CHEM 121, i.e., the MATH Primer will be dealt with (taught/reviewed/discussed) during class/lab in lieu of the MATH 126 as previously planned. This does not impact BIOL 190 assessment as lecturing on the MATH Primer in BIOL 190 was also in the works.

Post-script-script: As a result of reviewing the CHEM 121 enrollments in myWNC on 5 August 2019, CHEM 220 was added to Dr. Carman’s Spring 2020 schedule to provide rapid follow-up for pre-Orvis-BSN students taking the accelerated CHEM 121 Fall 2019.

Post-post-script-script: In addition, Dr. Carman e-submitted his Fall 2020 and Spring 2021 Schedules (5 August 2019, 1307, 1308 and 1309 hours PDT) to include sequences of CHEM that incorporate CHEM 122 and CHEM 220 to re-introduce those courses to the Carson Campus.