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Analyzing Effective Learning through a Chemistry Discourse

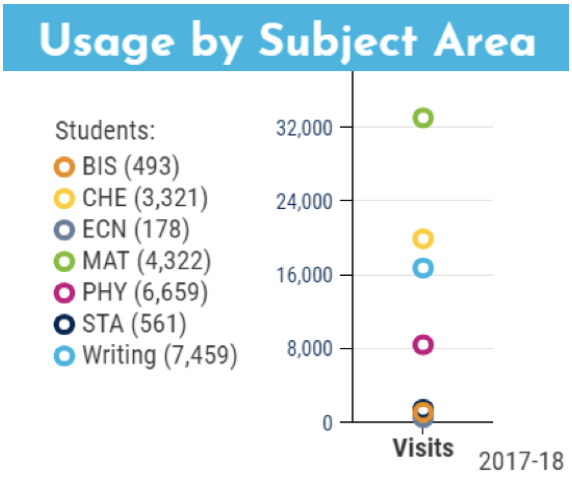
Introduction

Today, many colleges and universities require STEM students to take General Chemistry as a graduation requirement. Whether students will use this course as a part of their career, as a stepping stone to organic chemistry, or as a prerequisite for medical school, it's important for STEM students to obtain and retain a good amount of knowledge in their general chemistry course. Unfortunately, General Chemistry is a subject that many students struggle with and that some fail and have to retake.

In response to this, in order to help students succeed, many colleges and universities offer learning resources. At the University of California Davis, the Academic Assistance and Tutoring Centers (AATC) serves to " provide an inclusive and interactive environment where students participate in reinforcing and retaining knowledge in multi-disciplinary writing, math, and science+ through co-curricular academic services provided by both professional staff and peer tutors." (Academic Assistance and Tutoring Centers, 2019, p1). As seen in figure 1, in the 2017 - 2018 school year, over 3,300 student's received assistance/tutoring in the subject Chemistry from the AATC. (Academic Assistance and Tutoring Centers, 2019**)** The discourse community that is being analyzed, co-CHE2A, is a concurrent class (a zero unit workload course that is meant to

support students' learning while they simultaneously take a core course) that is offered by the AATC.

Figure 1.



(Academic Assistance and Tutoring Centers, 2019. p.4)

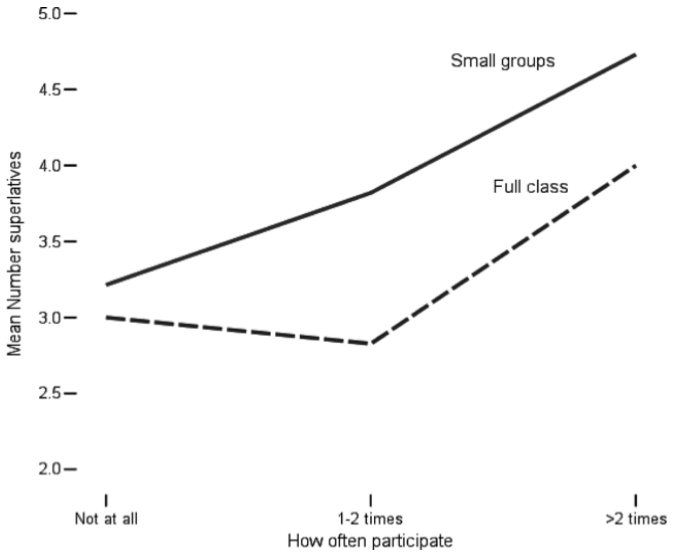
This paper aims to determine effective ways to operate challenging courses by analyzing the methods that the discourse community uses to operate. I focus on how small size ultimately helps with the goal of creating an effective learning environment by enabling different trends in intercommunication methods between members.

Review of Secondary Research

Tuttle. N (2020) believes that "Students who do small group work generally learn more of the material and retain their knowledge longer than students who don't" (Tuttle. N 2020) thus creating a better learning environment. However, Schwartz, Stiefel, and Wiswall (2016) challenge this vastly accepted belief. The authors analyze large and small learning settings by

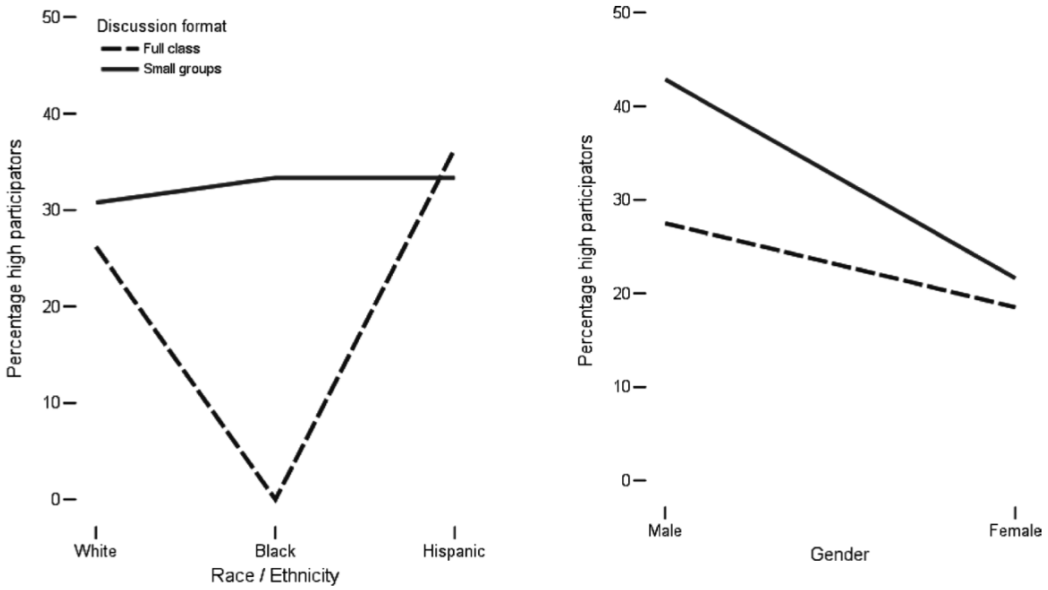
focusing on large and small public highschools in the state of New York. The authors argue that, when compared to large learning settings, there is no advantage nor relationship between successful learning environments and smaller learning settings. (Schwartz, Stiefel, Wiswall, 2016, p.273) Throughout the article, using data collected through surveys, the authors recognize that other factors such as an institution's age, bullying, background, interpersonal relationships, etc. go into creating an effective learning environment. Like Schwartz, Stiefel, and Wiswall; Pollock, Hamann, and Wilson (2011) also analyzed large and small learning settings. They did so by comparing small-groups and large-class settings. Through their study, as seen in figure 2, the authors found that having a smaller number of students, increased participation and ultimately benefited the learning environment. (Pollock, Hamann,Wilson, 2011, p.51 - 53) Additionally, as seen in figure 3, Despite the factors that Schwartz, Stiefel, and Wiswall mention, the authors show that the number of students in the setting still proved to be very influential.

Figure 2.



(Pollock, Hamann,Wilson, 2011, p.53)

Figure 3.



(Pollock, Hamann,Wilson, 2011, p.54)

Methods

The methods mentioned below were conducted in the manner that they were because, to analyze the factors that are unique to the discourse group, it is necessary to decipher between the different methods used within the discourse community (co-CHE2A) and the General Chemistry course (CHE2A). For the primary research, over the course of four days, research through observation was conducted and then comparisons between the two classes were made. At the start of each class (day 1: Tuesday and day 3: Thursday for co-CHE2A and day 2: Wednesday and day 4: Friday for CHE2A), the number of students present was noted. This information was determined by looking at "participants" on the zoom. When a student asked a question, made a statement, or made any type of valid contribution to the group/class, it was recorded. Statements such as "Thanks" and "Thank you", which are common at the end of zoom meetings, were

excluded, and therefore, not recorded. Additionally, it was noted whether the student interacted by talking aloud or by utilizing the chat feature. Note was also made of how many individual students interacted. This was done to evaluate the concentration of the interactions and to see if it was only a few students or if it was the majority of the class who were participating. Lastly, I reflected back on the content of the interactions with the two classes.

Results and Discussion

Primary Research Results

As seen in Figure 4, in the CHE2A course, on average there were 204 students present. There was an average of 0.406 interactions per student. On average, participation was quite concentrated amongst the students with only 20.1% of students participating. Of those who did participate, over 96% did so using the chat. As seen in Figure 5, in the co-CHE2A course, on average there were 13.5 students present. There was an average of 2.3 interactions per student. On average, participation was distributed amongst several students with 77.8% of students participating. Of those who participated, less than 49% did so using the chat. From this it can be concluded that in the co-CHE2A course, there are significantly less students, there is more participation and interactions per student, a greater percentage of students feel comfortable interacting by talking aloud, and that participation is more evenly distributed. Additionally, as for the content of the interactions, there were few major differences. In both the discourse community and the CHE2A class, interactions consisted of answering practice problems and asking questions for further explanation or clarification on the presented information, problem, etc. In the co-CHE2A course however, comments and questions were directed towards both the

professor and other students. This differed from the CHE2A course where comments and questions were only directed towards the professor or head TA.

Figure 4. CHE 2A Data

	Day 2	Day 4	Averages
# of students	198	210	204
# of participating students	39	43	41
Interaction via chat	77	84	80.5
Interaction aloud	2	3	2.5
Total interaction	79	87	83

Figure 5. co-CHE2A Data

	Day 2	Day 4	Averages
# of students	14	13	13.5
# of participating students	10	11	10.5
Interaction via chat	16	14	15
Interaction aloud	11	21	16
Total interaction	27	35	31

Analysis and Discussion

When comparing learning settings it can be assumed that smaller settings are more effective in creating beneficial learning environments. This is assumed because of the inverse relationship between participation and number of students and because it's known that when students "participate in the learning process [it] produces better educational outcomes at virtually all levels." (Reuell, P. 2019). When analysing why small settings are more effective, we can look at how small size allows for the trends in intercommunication methods between members. Two of the trends that are observed within the co-CHE discourse was a reliance on peer support and a lower, when compared to CHE2A, usage of the zoom chat feature.

Peer-Support

The number of students in the co-CHE allows the course to be Peer supported. The ideal setting for peer support would be a small setting. This is because when students learn within a small group setting they are able and more likely to interact amongst their peers and instructor. When looking at the primary research which compared large and small class settings, student to student interactions happened exclusively amongst those in the small group settings. When in a small setting, students conversed and received peer support reguarully. In the CHE2A course, while students still received support, they received this support from the professor or TA and not from other students. This is an indicator that the methods used within the co-CHE2A class are more effective because, going back to the discourse community's goal, Students who work together generally learn and retain the information being taught than students who don't (Tuttle. N 2020) When looking at a larger class setting, or the CHE2A course, peers interacting amongst each other is not only difficult due to the potential chaos if multiple students attempt to talk or use the chat simultaneously, but also because many students won't feel comfortable communicating in

the presence of two hundred plus students. This is seen in the primary research which shows that in the co-CHE2A class, which consist of 15 students, 77.1% of students participate while in the CHE2A class, which consist of over 200, only 20.1% of students participated. Additionally, Hamann, and Wilson (2011) found similar results when they compared large and small class settings in a study. They found that in the small class setting, students who didn't feel comfortable participating in the large classroom setting, whether it be because of race, gender, or academic standing (see figure 3), once in a smaller setting, felt comfortable participating. (Pollock, Hamann,Wilson, 2011 p.54) This may be because, in settings like the co-CHE2A course, because of the small number of students, students are able to quickly get to know their peers and this makes it easier to become comfortable enough to participate and interact with peers.

Another trend that was observed within the co-CHE discourse community can be found when looking at the usage of one the discourse's genres. When using Zoom, the co-CHE2A class had a preferred way to communicate with others. As mentioned in the results, when conducting primary research, it was found that the majority of the students in the co-CHE2A preferred to talk aloud on zoom while a large majority of the CHE2A students preferred to utilize the zoom chat feature. These differences also exist as a result of the differences seen in class size. I think that this pattern also ties into students feeling comfortable in their environment. Because the smaller classroom has a smaller environment, which tends to be more lax, students can feel more comfortable speaking aloud and feel less of a need to rely on the chat feature. When using the microphone, typically, it's more convenient and fast, but it's also more personal and invasive to an extent. So, students in the CHE2A course may be inconvenately using the chat feature to

avoid having to talk aloud in an environment where they may not feel comfortable. Once again, this uncomfortableness may be due to the fact that the large class setting doesn't allow students the opportunity to get to know their peers.

Conclusion

There is now a basic understanding of the importance of class size. After analyzing the primary and secondary sources, it can be concluded that a small learning environment plays a significant role in creating an environment that promotes learning. It does this by enabling different beneficial trends in intercommunication methods between members. Students who are struggling in challenging subjects such as chemistry can use this research to find courses, study groups, tutoring sessions, etc. that will have an effective learning environment so that ultimately, students can do well in their course.

Work Cited

Academic Assistance and Tutoring Centers. (2019) "2017 - 2018 Annual Review". 1-8. Retrieved from https://tutoring.ucdavis.edu/sites/g/files/dgvnsk1981/files/files/page/AATC-ANNUAL-REPORT-2017-18-web.pdf

Pollock, P, Hamann, K, Wilson, B. (2011). “Learning Through Discussions: Comparing the Benefits of Small-Group and Large-Class Settings”, Journal of Political Science Education, 7(1), 48-64. Retrieved from https://search.library.ucdavis.edu/permalink/f/1ns6oht/TN_informaworld_s10_1080_15512169_2011_539913

Reuell, P. (September, 4, 2019). “Study shows students in ‘active learning’ classrooms learn more than they think”. The Harvard Gazette. Harvard University. Retrieved from https://news.harvard.edu/gazette/story/2019/09/study-shows-that-students-learn-more-when-taking-part-in-classrooms-that-employ-active-learning-strategies/

Schwartz, A, Stiefel, L, Wiswall, M. (2016). “Are all schools created equal? Learning environments in small and large public high schools in New York City”. Economics of Education Review, 52(1), 272–290. Retrieved from https://search.library.ucdavis.edu/permalink/f/1ns6oht/TN_elsevier_sdoi_10_1016_j_econedurev_2016_03_007

Tuttle. N (2020). “Suggestions for Using Small Groups in the Classroom”. Chicago Center for teaching. The University of Chicago. Retrieved from https://teaching.uchicago.edu/resources/teaching-strategies/small-group-work/