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Being Afraid To “Look Stupid:” Examining Student Perspectives on Academic Interventions

by

Dalia Mazen Altubuh

An Honors Capstone

submitted in partial fulfillment of the requirements

for the Honors Diploma

to

The Honors College

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Honors Capstone Director: Dr. Jennifer Sims

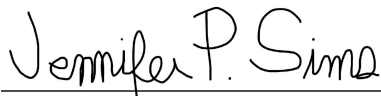
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Being Afraid To “Look Stupid:” Examining Student Perspectives on Academic Interventions

ABSTRACT

This study investigated the factors that influenced the experiences and academic success of college students in general chemistry and STEM disciplines. This was done considering psychological and sociological theories including social identity theory, attribution theory, self-efficacy theory, and expectancy-value theory. The study was conducted through interviews with seven college students, focusing on topics such as the quality of their high school chemistry classes, their utilization of academic interventions such as peer-assisted study sessions (PASS), and study techniques that may have an influence on academic performance. The study found that the quality of high school chemistry classes had a notable impact on students' confidence and preparedness for College General Chemistry—students who had negative experiences in high school chemistry reported nervousness and poor performance in the beginning half of the course. The study also revealed that academic interventions improved students' grades, but many students were reluctant to participate due to laziness, scheduling conflicts, and fear of “looking stupid” to their peers. The study highlights the importance of providing academic support to students in STEM fields. The results suggest that early intervention in high school chemistry classes and academic support programs like PASS can improve students' confidence and preparedness for General Chemistry, leading to better academic performance. The suggestions made by the students, such as offering different session times, recording the sessions, and offering additional incentives, provide practical insights for improving the effectiveness of academic support programs.

KEYWORDS: STEM, Social Identity Theory, Attribution Theory, Self-Efficacy Theory, Expectancy-Value Theory, Student Retention, Hierarchical Mentoring, Academic Intervention

INTRODUCTION

As it currently stands in academia, the science, technology, engineering, and mathematics (STEM) disciplines have a great deal of attrition. This is due to the great disparity between students who enter higher education in STEM-related fields and those who end up graduating with that focus of study. According to the U.S. Department of Education, 28 percent of bachelor's and 30 percent of associate degree students enter a STEM discipline (Chen & Soldner, 2013). In those that did so between 2003 and 2009, 48 percent of the bachelor's students and 69 percent of the associate students left the discipline by the spring of 2009 (Chen & Soldner, 2013). Only half switch to non-STEM majors—the rest drop out before earning a degree or certification (Chen & Soldner, 2013). Although this is akin to other various other fields of study, this is staggering considering the predicted increase in demand in STEM-based occupations. Between 2020 and 2030, while non-STEM employment is expected to increase by 7.5 percent, STEM occupation employment is expected to increase by 10.5 percent (*Employment Projections*, 2022). These findings regarding attrition and concerns for the workforce have presented themselves in a plethora of other studies.

Research has shown that, in addition, students that have less academic preparation or come from underrepresented demographic groups often develop belonging concerns within the first few weeks of class; this is intensified in response to failing assignments and exams (Fink et al, 2020). Without intervention, these students are more likely to leave STEM majors.

At our university, we have observed that academic assistance opportunities appear to be underutilized by General Chemistry students. In order to develop interventions that students will actually participate in, the purpose of this study is to gain insight into students' perspectives on General Chemistry courses and the academic success opportunities offered within them. After

reviewing the literature on various social and psychological theories describing classroom behavior, we describe our data collection and analysis processes before discussing the results within extant social-psychological literature.

Literature Review

As aforementioned, there is a significant amount of attrition in the science, engineering, technology, and mathematics (STEM) disciplines in academia. The disparity between students entering higher education in a STEM-related field and those graduating with a focus on STEM is foundational to this issue. It is crucial to address the factors that contribute to this high attrition rate to ensure that the demand for STEM professionals is met in the future. This is especially important with already-underrepresented racial minorities and female students (Bayer Corporation, 2012). This is likely influenced by treatment from other peers and professors and the lack of available resources and mentorship allotted to them. The present sociological research on STEM attrition has addressed a variety of factors have an influence on a student's experiences before and after entering college. These include gender, race, parental expectations, and being a first-generation college student among other things. Regarding experiences prior to entering college, available high school courses and students' experience within them greatly influence students not only remaining in a STEM field but also whether they choose a STEM discipline in the first place (Bayer Corporation, 2012). Similar findings regarding minority students are discussed in the article "African American Students, Retention, and Team-Based Learning: A Review of the Literature and Recommendations for Retention at Predominately White Institutions" by Vanessa Hunn (2014).

In addition, there is a large emphasis on factors after entering higher education. Research has shown that factors such as university demographics, course offerings, and access to

assistance (such as tutoring and mentoring) have an undeniable influence on the quality of education (Wilson et al., 2011; Wilson et al., 2015). In the event there is a lack of diversity within these elements, it can have a negative impact on student retention, particularly for minority students. Other factors that are found to increase attrition include a lack of belonging and connectedness, poor study habits, and a lack of appreciation for experiences regarding their major (Hunn, 2014; Williams et al., 2018; Wilson et al., 2011; Wilson et al., 2015).

With the aforementioned high drop-out rate in the STEM field, especially in modern times when they are becoming increasingly needed, there is a great benefit in examining student perspectives on provided interventions– and lack of– and whether they impact STEM education. Asking questions is an integral part of learning, understanding, and academic progression. Despite this, students are reluctant to do so even if it is at the expense of their academic success. A growing body of research acknowledges the existence of this reluctance, and the accompanying literature seeks to explain it.

There are a number of social and psychological theories that can be applied to the low retention rate in STEM-oriented majors. This work will focus on five: Social identity theory, self-efficacy theory, attribution theory, expectancy-value theory, and impression management theory.

Social identity theory is a well-established social-psychological theory that describes the influence of membership in a social group on individuals' identities. It also explains that individuals will tend to identify themselves into social groups sharing similar values, beliefs, and experiences among other factors. There are numerous examples of social identity theory and its influence on behaviors in the classroom, from both peers and instructors. In the article, "The Role of School in Adolescents' Identity Development. A Literature Review" Verhoeven et al.

aimed to integrate research on the role of schools in adolescent identity development from various theoretical perspectives (2018). They identified unintentional impacts on adolescents' identities through messages communicated in school, including differentiation and selection, teaching strategies, teacher expectations, and peer norms. Secondly, intentional support for adolescent identity development was found through different types of explorative learning experiences, including in-breadth exploration, in-depth exploration, and reflective exploration. Finally, it was suggested that these explorative learning experiences should be meaningful and situated in a supportive classroom climate to foster adolescent identity development. Schools and teachers were found to be often unaware of their significant impact on adolescent identity development (Verhoeven et al., 2018). Another study by Manya Whitaker utilizes social cognitive psychological theories to explain why White urban teachers often struggle to create loving spaces in urban classrooms (2020). This is especially relevant when their students come from social groups different from their own. The framework of social identity theory is employed, and social categorization theory is used to describe how the sociocultural context of urban schools creates and sustains the archetypal teacher savior identity. Social identity theory's description of intergroup behavior and organizational role are used to describe how the group norms of teacher saviors create a hierarchy between teachers and students. This, unfortunately, leaves little room for warmth and caring. The concept of a transformationist teacher identity is introduced as a result. This provides suggestions for how teacher educators can help preservice teachers cultivate positive teacher-student relationships in their future classrooms are offered, ultimately arguing that urban teachers must be metacognitive about the ways in which their identities are constructed and enacted in schools to care about and for their diverse students (Whitaker, 2020).

Self-efficacy theory is another psychological theory relevant to this study. This explores how an individual's belief regarding their ability to succeed can influence their motivation and behavior. Those with high levels of self-efficacy tend to engage in behavior that will ultimately lead to success, while those with low self-efficacy may have reduced motivation to do so. An article by Junko Maeda examines the emotional barriers that impede international students' participation in class discussions with consideration of self-efficacy (2017). Maeda conducted in-depth interviews with international students to explore this. The study found that fear, embarrassment, social isolation, judgment, and discrimination were the main barriers to participation. The authors used self-efficacy theory to suggest a possible intervention approach for educators to help international students express themselves in the classroom (Maeda, 2017). In another article by Yue et al., an exploration was conducted regarding the connections between self-efficacy, fear of negative evaluation, and negative silence in the classroom (2022). While previous research has established that self-efficacy and fear of negative evaluation are associated with negative silence, this study aims to determine whether self-efficacy affects negative silence through fear of negative evaluation. They found that nursing students who had higher levels of self-efficacy were less likely to experience fear of negative evaluation and negative silence in the classroom. Additionally, fear of negative evaluation was found to partially mediate the relationship between self-efficacy and negative silence in the classroom. The study suggests that interventions to reduce the fear of negative evaluation may help address negative silence in the classroom among nursing students, ultimately promoting better classroom teaching and learning (Yue et al., 2022).

Other theories that may be helpful in this study are attribution theory and expectancy-value theory. Attribution theory can be used to explain why some students are

hesitant in regard to academic participation. This theory describes how individuals make explanations or attributions for their own and others' behavior. For instance, students may attribute their failure to ask questions in class to internal factors (like incompetence or a lack of motivation) rather than external factors (like a difficult classroom environment), causing them to feel embarrassed and ashamed. This is explored in Sandra Graham's article, "An attributional theory of motivation" (2020). Specifically, Graham investigated teacher behaviors like praise and blame potentially functioning as cues for low ability. The article also reviews the three dimensions of causes - locus, stability, and controllability - and how they are linked to specific psychological and behavioral outcomes (Graham, 2020). Conversely, the expectancy-value theory proposes that students who believe asking questions is beneficial for their academic success are more inclined to do so. Conversely, students who do not see the value in asking questions may not be motivated to participate. Cooper et al. use this theoretical lens to understand student resistance to active learning (2017). The study examines student perceptions of active learning and finds that students showed positive changes in the components of expectancy-value theory and reported high levels of engagement in active learning. They suggest that the expectancy-value theory can be used to boost student perceptions of active learning and their engagement in active learning classrooms (Cooper et al., 2017).

In addition to these theories that explicate interviewees' fears or reluctance regarding seeking assistance in General Chemistry, Goffman's (1956) theory of impression management is applicable as well. In particular, his concepts of "presentation of self" and avoiding "losing face," also offer explanatory insight into our interviewees' feelings and behaviors regarding help-seeking. Goffman analogized everyday social interactions to actors' performances on a stage. Like actors, people in social interactions work to present themselves in certain ways to

certain audiences. Flawed performances, that is failing to achieve or maintain the desired impression in the minds of the audience, causes embarrassment, which Goffman calls “losing face.” Within this framework, then, our interviewees’ and other students’ disinclination to seek help when they began to struggle in General Chemistry can be understood as an attempt to avoid losing face, that is to maintain their public presentation of self as being a “good” student. This presentation of self was dysfunctional (as described by Robert Merton in the 1930’s), though, in that it, firstly, prevented them from receiving the assistance they need to actually perform well in the course and, secondly, it did not actually give the impression of “good student” to professors who, from our own experience, consider “good” students to be those who utilize available resources when needed.

Lastly, in an article by Brewer et al., an investigation into the low retention rate of STEM students was conducted (2021). The study found that STEM interest was associated with a love for the discipline, high school teacher encouragement, and success in academic coursework. However, upon entering college, students encountered obstacles that made them feel inadequate, unprepared, and overwhelmed, leading to them switching out of quantitative STEM majors. The study highlights the need for interventions to address these obstacles and promote student success in STEM (Brewer et al., 2021). Similar factors are considered in the following study.

By taking the several aforementioned theories into consideration, insight may be gained into why students may feel reluctant to engage in the classroom and be proactive in their academic success. In addition, it may also provide ways in which instructors and educators can address these obstacles and maximize student potential.

METHODS

The student researcher received a copy of the professionally transcribed data on a personal hard drive. The data compiled were the interviews of seven students who have taken General Chemistry. First, they devoted time to an initial reading and understanding of the data before attempting to code the information presented. The student researcher found that the presented information could have been categorized into twelve major themes from the interviewees' responses. To start, Google Sheets was used to organize their thoughts. Then a shift was made to use HyperRESEARCH for the remainder of the analysis. HyperRESEARCH is a free qualitative analysis analyzer that the student researcher used to create these overarching analytical categories.

The first of these categories was 'academic background.' This included factors such as having taken AP chemistry (as opposed to high school chemistry) and whether the student had a STEM major. Then there was the students' general attitude about chemistry, both in general and as the General Chemistry class progressed. There were also analytical categories dedicated to both availability and convenience of assistance and professor/teacher assistant attitude. In addition, assignment performance (divided into how it changed as the class progressed), study habits (coded in addition by its reported effectiveness by students if applicable), and utilization of the offered, extra Workshop were designated analytical categories. Furthermore, analytical categories were committed to extracurriculars (work or athleticism), friendships (segmented into whether the students were exclusively friends throughout the duration of the course, or if their friendship continued after its completion) and belongingness, and women in STEM. The last analytical categories were regarding the limitations preventing students from asking for assistance when needed, and reported general suggestions to improve the availability and

utilization of assistance by students. These eleven analytical categories encompassed a total of 48 different codes. In consultation with the research, the student researcher considered the application of prior research to the interviewees' responses.

Recruitment and Sample

After receiving approval from the university's Institutional Review Board, participants were recruited from the Fall 2021 General Chemistry I at a mid-sized primarily white Research 1 university in the U.S. South. This resulted in a sampling frame of 472 students who the second author BCC emailed inviting them to participate. The email described the purpose of the research, offered \$10 compensation, and invited students 18 years or older to participate. Two weeks later, a reminder email was sent to just the students who had not yet responded.

This research was conducted in Spring 2022, a semester which saw “A ‘Stunning’ Level of Student Disconnection” (McMurtrie, 2022). In line with the phenomenon observed all around the country, students' response rate was extraordinarily low. Only eight students volunteered for the study with seven following through to complete an interview. The limitations of this small sample size are discussed in the Conclusion; however, the interviewees' accounts provided rich insights into their own and their friends' experiences, thinking, and behaviors which, as discussed below, provide Chemistry Educators with valuable information despite the lack of broad generalizability.

In order to ensure the anonymity of any minority volunteers, demographic information was not collected from the volunteers. However, based on participants' selected pseudonyms as well as the self-references they made within their interviews, our sample contains two women and five men. In addition, three participants were engineer majors at the time of the interview, one switched from engineering to education, and the remaining three were not stated. In regards

to the degree of chemistry knowledge prior to entering the course, two of the interviewees had taken advanced or AP Chemistry, while the remaining five had a general, high school chemistry course.

Data and Analysis

Interviews were transcribed by a professional transcriptionist. The transcripts were then coded by the third author, under the supervision of the second author, in the free download version of the qualitative data analysis program HyperRESEARCH. Following Deterding and Waters (2021), data were examined for themes via both deductive and inductive approaches. The third author began deductive coding by identifying text in the transcripts that provided information on the team's research questions of students' perspectives and experiences in the class and with the semester's two intervention workshops. Following this, she examined the data for emergent themes to code. Apropos to Thorne's (2020) directive for qualitative analysis to go "beyond theming," the second and third authors drew on psychological and sociological literature to identify theoretical explanations for the empirical patterns identified.

DISCUSSION OF RESULTS

To begin, the impact of high school chemistry experiences on students' views of General Chemistry in college will be discussed. Accompanying it, the experiences of the interviewees, are presented. Then, an evaluation and discussion regarding study techniques and academic interventions (such as Peer-Assisted Study Sessions) will be done. In tandem, their use and effectiveness are considered. This will go on to show how the experiences of the interviewees and theoretical concepts relate to each other. Lastly, suggestions for educators and students will be evaluated.

“They don't want to feel like they look dumb”

As in the literature discussed above on this topic (Brewer et al., 2021), high school chemistry mattered. In our sample, three of the seven interviewees—Katie, Camber, and Bartholomew—reported negative experiences in their high school chemistry course. The other four reported non-negative experiences: three of them were positive (Rebecca, Bob, and Diego), and one reported an instructor who “wasn’t the most thorough” but made no comment on a perceived impact on the quality of their high school chemistry class (Jonny). The quality of one’s high school chemistry experience appeared to impact interviewees’ views on going into General Chemistry in college. For example, Katie, reporting a negative experience, explained, “I was very nervous [going into the course] because I’ve never been good at science.” By contrast, Diego, who reported a non-negative experience, claimed, “[I felt] Pretty confident...I felt a little more comfortable taking it. It was a kind of a happy place for me, honestly.” This was a consistent trend amongst the interviewees—each of the three participants who reported a negative experience described nervousness entering the course. The other participants described feelings of confidence and preparedness. Only one of those interviewees with a positive experience, Bob, described nervousness. He attributed this to having had such a long time between this course and his prior chemistry class. He, however, prefaced this with, “I like chemistry quite a bit. So I was pretty excited.” These consistencies with positive experiences and positive emotions entering the course were consistent with the findings reported by Brewer et al., 2021. Moreover, these mindsets were indicative of assignment performance to an extent, especially at the beginning half of the course. All three individuals reporting negative experiences in high school chemistry reported performing poorly on at least one of the first two exams; the others described far more positive outcomes.

The interviewees explained that the first two exams often were a review of material they had learned before in high school. As a result, for the remaining students, it was not until the third exam that their grades began to decline. It was at the point when they noticed this downward trend did many of them decided to use PASS and other academic interventions. All seven of the interviewees admitted that available resources are beneficial for academic success and saw improvements in scores after utilizing them. Despite this, there is relatively little initiative for other students to utilize them. When asked why this may be the case, they explained that this may be due to laziness, conflicts in scheduling, and an underestimation of how beneficial they are. Jonny described:

“They don't understand how helpful they actually are. Even though statistics and numbers have been put out about them and how students have improved. It's one of those things that you don't know how good it is until you see it for yourself. And I guess that's kind of the problem, is trying to figure out how to get people to the PASS sessions...I think it's also a little bit of a lazy thing...I was just too lazy after practice and didn't feel like moving from my bed.”

The following is attributable to the expectancy-value theory. Despite an understanding that PASS and other academic interventions improve course success statistically, students do not perceive the interventions as beneficial for their own benefit.

In addition to this, of the seven students interviewed, five of them describe that their peers may be reluctant to seek help because of a ‘fear of looking stupid’ or general embarrassment. Rebecca stated: “ I feel like students would not reach out or don't ask questions because they don't want to feel like they look dumb. Or look like they don't understand. Or look, quote unquote, stupid. I always went into school thinking there is no such thing as a dumb

question. And some people have, have grown up or gone to school with the experience of that is the case.”

This explanation of students’ reluctance to participate in their education and ask questions exemplifies many of the theories discussed in the literature. Most clearly, this described social identification theory. Students who are afraid of looking stupid may see themselves as part of a group that values intelligence and academic success. They may also view those who ask questions or seek help as not belonging to the group or not sharing the same values. In addition, impression management theory can also be applied here, as it suggests that individuals may alter their behavior to create a favorable impression on others and prevent themselves from “losing face” (Goffman, 1956). In either case, students’ reluctance to seek help for fear of appearing incompetent or unintelligent in front of their peers results in them altering their behavior (avoiding asking questions or seeking help) to avoid negative social evaluation or judgment from their peers. One may also interpret this as an example of attribution theory, as it suggests that students may attribute a need to ask questions to internal factors such as low intelligence or lack of motivation rather than external factors such as a difficult classroom environment or a challenging course subject. It could also exemplify expectancy-value theory, as it highlights the importance of students perceiving asking questions as valuable for their academic success in motivating them to engage in this behavior. In further support of these notions, Bob also described:

“I think sometimes like in public high schools, people will make fun of you for not being smart at a certain subject that they're smart at. And so a lot of students still have that ingrained into their mindset. And so they feel like if they go to the PASS session, they're going to be shamed or it's going to look bad. Like if their friends see them walk into the PASS session to go

do extra studying. But in reality, it's just, it's just, you might need to do some extra problems or so. And everyone has that once in a while.”

Each of the interviewees described that attending PASS resulted in improvements to their academic work. The effectiveness of the peer-assisted study sessions can be investigated through the lens of hierarchical mentoring. A study done by Wilson et al. (2011), suggests that hierarchical mentoring is effective in improving student retention in STEM fields. The Professors Program described in their work included a comprehensive mentoring approach that involves multiple levels of mentoring, including faculty research mentors, research group mentors, and staff. The mentoring component is described as being multidimensional and includes academic advisement, undergraduate research, and career exploration opportunities. The program also emphasized the importance of individualized academic advising to direct a student's metacognitive journey into academic success. Overall, this passage suggests that the combination of multiple levels of mentoring and individualized support can be effective in improving student outcomes in STEM fields. All of these components work together to contribute to students' transition from academic underperformance to their eventual retention through graduation (Wilson et al., 2011). In further support of this, a study done by Cavnar and Stanny (2018) also suggests that hierarchical mentoring had a positive impact on the first-year cumulative GPA and retention rate of first-time-in-college (FTIC) students. ANOVA analysis showed that students who participated in the program in their first year earned significantly higher GPAs than those who did not. The ANCOVA model that included high school GPA as a covariate also supported this finding. Additionally, significantly more students who enrolled in the program were retained compared to students who did not. Despite the general success of the program, a positive impact

was not found for underrepresented minority students (Cavnar & Stanny, 2018). This hints at the potential influence of other factors, such as allotted resources and belonging.

The analysis also revealed that students who enrolled had higher high school GPAs, suggesting that students self-select to enroll in the course based on their academic ability (Cavnar & Stanny, 2018). Overall, the study provides evidence for the effectiveness of hierarchical mentoring in improving the academic success and retention of FTIC students (Cavnar & Stanny, 2018). This can be connected to self-efficacy theory in addition to study habits learned throughout the students' primary education. In describing the study techniques that *worked* for students, there was a great deal of emphasis on reviewing notes and applying them to practice problems. In addition, six interviewees discussed studying with a friend; only one individual indicated a preference for studying alone due to the distractions that accompany a group setting. When describing study techniques that were not effective, many students included skimming notes, memorization (that did not involve the application of those concepts), and cramming shortly before the exam. This can be interpreted through self-efficacy theory and Graham's (2020) study. The students who emphasized reviewing notes and applying them to practice problems likely had higher levels of self-efficacy, as they believed they could successfully apply the concepts they had learned to solve problems. On the other hand, the ineffective study techniques described, such as skimming notes and cramming shortly before an exam, may indicate lower levels of self-efficacy, as these strategies may be seen as a way to quickly memorize information without truly understanding it. Furthermore, Graham's (2020) article suggests that the attribution of success or failure can influence motivation. Students who attribute their success to their own effort and ability are more likely to be motivated to continue working hard, while those who attribute their success to external factors (such as luck) are less likely to be

motivated to put in effort in the future. The effective study strategies described by the students in the passage may have led to a sense of self-efficacy and a positive attribution of success, which could in turn motivate them to continue using those strategies in the future.

Despite this barrier, the interviewees provided extensive details on the influence of their ‘professor’s attitude’ in overcoming these limitations. This reportedly influenced not only whether a student would reach out to the professor for help but also if they would utilize available resources. By professor attitude, interviewees describe the professor's character and mannerisms in their interactions (or lack thereof) with them or other students. ‘Professor’s attitude’ was reported in ways analogous to perceived approachability, involvement of the professor in their student’s academic pursuits, and dedication placed into teaching their course. The interviewees reported a positive relationship between professor’s attitude and their own help-seeking, meaning that when they perceived their professors as having a positive attitude they would seek help when needed while if they perceived their professors to have a negative attitude they would not.

As stated prior, all seven students interviewed had attended PASS at some point throughout the semester and explained it contributed to course success. Despite this, six students attributed their course success (or the use of the available resources) to their professor. Jonny explained that the PASS session “actually helped” him understand the material “more than just sitting during the lecture.” However, when Jonny was asked to what he attributes his A in Gen Chem, he neglected to mention his consistent PASS attendance. Instead, he focused on the positive attitude of his professor:

“She was a really good, really good teacher... She was, she was entertaining with it. She was always upbeat. And she definitely knew what she was talking about. And you can tell that

like, she, she was into it. So it made me more into it. Like, I'm not a huge chemistry fan. But she, her teaching style is easy to digest the information she was giving to you. And if you wanted to review her Canvas page, it was set up perfectly.” Similar responses were given by Rebecca. While she mentions attending PASS sessions contributed to the improvement in her grade in the class, she gave primacy to her professor’s positive attitude. Bob also answered similarly. Although Diego and Katie were not given this prompt directly, they also describe their professor as having a great influence on their experience in the course, more than they mention the benefit of PASS. When prompted, Bartholomew and Camber attributed their success to PASS and time management respectively. Camber, however, discussed the positive role played by his professor when asked about how his General Chemistry course compared to other STEM courses immediately afterward, “I really liked my teacher...She was really helpful.”

These students’ experiences suggest that professors have a profound impact on students’ attitudes, perceptions, and behaviors beyond what one may expect from the limited duration they lecture. This is exemplified by Rebecca’s description of her professor:

“I always felt like if I felt like I couldn't ask the question in class, I could email the professor the question later on. Or the professor could, would send out an email like, if there are any questions, please don't hesitate to email me or contact me. Come to office hours. Kind of like being anonymous so nobody knows...I feel like they don't want to look like they don't understand in front of peers.” Similar statements were made by four other students. Furthermore, four students described courses in which the instructor was unapproachable. For these courses, they described difficulty in understanding and studying the material, reduced or no initiative to utilize resources to better their performance, and even [other] students ‘sitting in’ the lectures of

other instructors to understand the material. This is described in further detail in the discussion of recommendations for professors.

In addition to professors' attitudes, feelings of belonging influenced the success of students in their coursework. An example of this is the majority preference for studying in groups. Students expressed greater comfort in reaching out to peers when they struggled with their coursework. These experiences align with the current understanding of social identity theory: students who identify with a particular group, including their classmates or academic peers, may perceive them as being more likely to understand their struggles and provide effective support due to their similarities. In addition, these findings resemble those made by Hunn, 2014; Williams et al., 2018; Wilson et al., 2011; Wilson et al., 2015.

Another intervention that was provided in tandem to PASS was a special Fall 2021 Workshop. Of the seven interviewed students, however, only one student (Camber) attended it. The lack of attendance by the other interviewees was explained as a scheduling conflict for both times the workshop was offered. Although definitive conclusions cannot be made using only one account of their experiences, Camber's opinion of the Workshop can be discussed. Camber described his motivation for attending as a result of his poor performance on the second exam in the course. When asked about his experience, he said:

“The biggest thing I learned with that was you have to make time to be a human. You still have to go see friends and do fun stuff. Because I was bad about locking myself in a room last semester and just doing work, I lost a lot of my motivation...I had something to look forward to at the end of the week. I paid attention more to my homework and started being more present when I was in class...I think all of it was useful.”

Camber's response to the Workshop was promising. It is clearly important to maintain a balance between the academic and personal parts of life and from his account, students have a tendency not to. By devoting more time to his personal hobbies and social interactions, not only was he more engaged with his coursework, but he also seemed to have an improvement in his quality of life. Although more investigation is warranted, this is a promising indication that a balance between these two aspects of life can result in greater overall success and happiness.

“For most of us, we’re encouraged by food and stuff”: Recommendations

As mentioned prior, there are a variety of reasons explaining why students may not attend PASS sessions even when they were struggling with their coursework. The interviewees were asked to provide suggestions that may mitigate this discrepancy. Many suggestions included offering different session times, offering more sessions, or recording the sessions, making them available to students who were unable to attend. Many of the students reported an inability to attend sessions due to scheduling conflicts. This was especially true for student-athletes, student workers, and commuters.

In addition, Jonny and Diego both suggested conducting the sessions immediately after the lecture in the same room to increase convenience. Other students suggested offering extra credit for attending the sessions. Diego in particular stated, “For most of us, we’re encouraged by food and stuff.”

This is interesting in that while the expectancy-value for the improvement of their academic performance was not a completely persuasive factor for students, there seems to be a motivating value placed on tangible rewards like food and extra credit. Conversely, this may be analyzed using attribution theory or social identity theory. By being able to attribute their attendance to the provided incentive instead of an individual need or poor course performance,

students may be able to experience more comfort with attending and discussing their experience with their peers. Furthermore, if the incentive is something that is valued by the group to which the student belongs (such as free food for college students, as described by Diego), it can reinforce the student's sense of belonging to that group and encourage attendance. In other words, the incentive is not just a material reward, but it also signals that the student is part of a valued group and their participation is important. This can lead to increased motivation to attend, as the student sees attendance as a way to reinforce their sense of belonging to the group and gain social approval from in-group members. In general, by providing a form of appreciation and acknowledgment for students' efforts and time spent attending the sessions, instructors can potentially foster a positive attitude towards learning and the course material. In addition, they may be able to improve student self-efficacy, initiative, and academic performance.

Likewise, an effort by the professor to encourage these interventions and connect with students may be perceived similarly by students. When asked to provide suggestions for professors, three of the seven students expressed the belief that professors should take initiatives to connect with and aid students. In doing so, they believed that students would be more likely to seek help when needed in the course. The other interviewees expressed that their General Chemistry professor did this relatively well.

Upon inquiry for suggestions to other students, the interviewees encouraged PASS attendance and the use of academic interventions if needed. Camber stated, "For students, don't be prideful. Just go get help when you need to. Nobody knows everything." In addition, he encouraged an academic and personal life balance having attended the workshop. Furthermore, the interviewees encouraged 'staying on top of things' as opposed to cramming. Lastly, the students suggested connecting with other peers.

CONCLUSION

This research was conducted in the Spring 2022 semester, a unique time in higher education when professors nationwide were “using words like ‘defeated,’ ‘exhausted,’ and ‘overwhelmed’” to describe their students (McMurtrie, 2022). Our small sample size of seven is no doubt a direct result of this and other difficulties (such as the Omicon surge of Covid-19) that were occurring during recruitment and data collection. The students who volunteered for this study, in addition to being few, were also quite homogenous in this Chemistry experience. For example, all of our interviewees passed the course with a high grade, meaning the experiences of students who performed to average or failing standard, or who withdrew from the course, are not included.

Nonetheless, our work, being conducted at the point in time that it was, offers not only a glimpse into how well-performing Chemistry students fared during the first semester of return to in-person instruction but also how those students were thinking about Chemistry education during an incredibly stressful time in higher education. Like all qualitative work, from large N interview studies to single-site ethnographic case studies, the aim of our research was not to produce generalizable quantitative insights or predictive models but to gain an understanding of the lived experiences of members of the focus population.

To that end, our results show that several factors influenced the experiences of seven college students in general chemistry, including their high school chemistry classes, academic interventions, and reluctance to seek help. Our study found that the quality of high school chemistry classes affected students' confidence and preparedness for general chemistry, with negative experiences leading to nervousness and poor performance in the beginning of the course. In addition, while utilizing academic interventions like peer-assisted study sessions

(PASS) improved students' grades, many were reluctant to participate due to various reasons such as laziness, scheduling conflicts, and fear of looking foolish or being ridiculed by peers.

Moreover, our study revealed that hierarchical mentoring, such as academic advisement, undergraduate research, and career exploration opportunities, could improve student retention in STEM fields. However, attendance at PASS sessions was low and only one interviewed student attended the Fall 2021 Workshop. Scheduling conflicts and lack of motivation were commonly provided reasons for the others' lack of attendance. Despite this, the students who do end up attending report improvements in their coursework. In addition, the student who attended the Workshop suggested maintaining a balance between academic and personal life, and described that this improved their education. To increase attendance, students suggested offering different session times, recording sessions, offering incentives such as food or extra credit, and conducting sessions immediately after the lecture in the same room for convenience.

Our study was qualitative and aimed to understand the lived experiences of our focus population. Therefore, our results highlight the importance of appreciating and acknowledging students' efforts and time spent attending sessions for positive changes in attribution, social identity, expectancy value, and self-efficacy. The students also recommended connecting with peers and promoting a balance between academic and personal life. Lastly, students conveyed the importance of the professor's initiative in offering connecting with students and encouraging academic interventions in the utilization of these resources.

Based on the following results, there are multiple directions future studies can take. The simplest would be to increase the sample size and reconduct this study, interviewing students who have both passed and failed the course. This is especially true regarding the benefits of the Workshop in improving student performance. Beyond the simple aim of collecting data on these

topics from a larger sample of students, future research could also conduct a longitudinal study to provide insights into how students' experiences in high school chemistry and general chemistry change over time. Another potential focus is how academic interventions and mentoring programs impact their long-term academic and career success. In addition, a study could focus on exploring the impact of mentoring programs on students' career aspirations. While the study found that mentoring programs could improve student retention in STEM fields, it did not thoroughly examine the impact of these programs on students' career aspirations. Future research could investigate how mentoring programs impact students' career aspirations and whether these programs encourage students to pursue graduate education or careers in STEM fields. Lastly, additional psychological and sociological theories can be observed in various academic contexts, offering potential avenues for improving intervention use and academic success.

In conclusion, this study sheds light on the factors that influence students' experiences in general chemistry, particularly in regard to various psychological and sociological theories. In addition, it provided valuable insights into the effectiveness of academic interventions in improving students' academic performance, student attribution, social identity, expectancy value, and self-efficacy. The findings of this study have important implications for educators, administrators, and policymakers in designing and implementing effective interventions to support students' success in STEM fields. By understanding the factors that influence students' experiences, educators can create more supportive and engaging environments that promote student success. Additionally, the study's recommendations for improving academic interventions, such as offering flexible session times, providing incentives, and connecting students with peers, can help to address the barriers that prevent students from seeking academic

support. Overall, this study highlights the critical role of effective academic interventions in promoting student success and retention in STEM fields.

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**Being Afraid To “Look Stupid:”
Examining Student Perspectives on Academic Interventions**

by

Dalia Mazen Altubuh

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Honors Capstone Director: Dr. Jennifer Sims

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