STUDENT-INITIATED RESEARCH, CONSEQUENCES, PEER MENTORS, AND FINDING THE HOPE INSIDE FOR MILLENIGENZ STUDENTS DURING THE COVID-19 YEARS

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Student-Initiated Research, Consequences, Peer Mentors, and Finding the Hope Inside for MilleniGenZ Students during the COVID-19 Years

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The Office of Undergraduate Research (OUR) at Cal Poly Pomona explored factors contributing to student enrollment and engagement, especially for MilleniGenZ students. The research was built on the latest evidence that college students who engaged in research along with faculty mentoring and team collaboration were more able to persist in their studies than their peers who did not participate in similar activities. Most important for OUR was testing if participation was equitable by race, gender, and income categories in COVID-19 years (2020-2022) as compared with non-COVID-19 years (2016-2019). The study used quantitative analysis of the public record, qualitative review of student reflections, and open-ended interviews with peer mentors during the COVID-19 years of 2020 through 2022. As a result of our process, this is a convergent mixed methods design, which enabled the researchers to triangulate the findings and develop a deeper understanding of the research question: How well did diverse students navigate their college studies in uncertain circumstances?

Either American higher education is significantly flawed, or it is the best educational system in the world. Undoubtedly, higher education in the United States has its problems: declining enrollment, rising costs, and declining academic freedom (Whaples, 2022). Higher education has also been highly innovative and adaptive to new technologies and has embraced access to less expensive and sometimes free online education sources. The traditional model of higher education has proven far more efficient than similar programs offered by private businesses, the military, or non-profits (Rosendale, 2017; Smith, 2000).

At the California State Polytechnic University, Pomona (Cal Poly Pomona or CPP), successes and challenges have been monitored carefully by program administrators, philanthropic partners, the legislature, students, faculty, and labor unions, to name just a few. The Office of Undergraduate Research (OUR), a student success program that began in 2013, wanted to know what factors contribute to student enrollment and engagement, especially for MilleniGenZ students. This research effort began with the definition of student success that led to OUR's authorization in 2013. OUR was built on the latest evidence that college students who engaged in research along with faculty mentoring and team collaboration were more able to persist in their studies than those whose college experience was classes, homework, exams, and faculty-designed project assignments (BrckaLorenz et al., 2017; Fechheimer et al., 2011; Jones et al., 2010; Kuh, 2008; Lopato, 2010). Between 2015 and 2020, the OUR at Cal Poly Pomona conducted a longitudinal study with over 6,000 unique students and determined that students who participated in research-related activities were almost twice as likely to graduate as students who did not participate in research-related activities. (Dong et al., 2021) This current study extends the previous study by testing if participation was equitable by race, gender, and income categories in COVID-19 years (2020-2022) as compared with non-COVID-19 years (2016-2019).

The quantitative analysis of the public record for OUR enabled us to probe only so far into what was going on. Consequently, we augmented this analysis by exploring student experiences and motivations through two qualitative methods. The first was to review student written reflections prepared for a student-initiated research program called Projects Hatchery (Hatchery) to understand how the students defined their research and its consequences. The second method was to utilize open-ended interviews with peer mentors who gave their time and energy to one or more fellow student mentees during the COVID years of 2020 through 2022. This combination of an explanatory (quantitative) analysis of the public record of student demographic characteristics was collected and analyzed at approximately the same time as the exploratory (qualitative) analysis of student papers and open-ended interviews with peer mentors. As a result of our process*, this is a convergent mixed methods design* which enabled the researchers to triangulate the findings and develop a deeper understanding

of the research question: How well did diverse students navigate their college studies in uncertain circumstances?

Literature Review: The Research Experience

Scholarly literature has remarked that the research project experience was not a single behavior but a bundle of activities that included collaborating with faculty, advising, working in teams, brainstorming ideas, and taking a multi-disciplinary approach to solving problems (Casper et al., 2022; Ehmke et al., 2022; Fechheimer et al., 2011; Jones et al., 2008; Lopato, 2010). What was not understood was whether the association between experiential research and key outcomes were limited to relatively normal and predictable environmental contexts, or if these efforts would endure during the turmoil of the COVID-19 pandemic.

Several studies indicated that stay-at-home orders, social distancing, and the closing of public and private institutions had an impact on college students regarding stress, sleep, motivation, completing assignments, and rising anxiety (Benham, 2021; Casper et al., 2022; Ehmke et al., 2022; Munsell et al., 2020; Zarandi et al., 2023). Fellow students, teaching assistants, and staff were often among the first to notice that students were struggling with mental health and emotional issues as well as other disruptions of the pandemic. These academia members were among the first to try to modify assignments, mitigate Zoom exhaustion, adapt study aids, and start impromptu chat sessions to meet the challenges of despondency and depression (van de Pol et al., 2022; Zarandi et al., 2023). COVID-19 policies initiated a significant shift in how educational programs were provided to students. Mental health issues, which had been separate and distinct from classes, began to creep into class sessions, faculty research agendas, and public policy discussions. By 2023, states declared the pandemic over. (NAHSP 2023; Zarandi et al., 2023).

COVID Aftermath

There were assertions in the scholarly and popular press that institutions of higher education would return to a pre-COVID-19 normal or the Zooming-virtual classroom had become a new standard for higher education. Some scholars asserted that post-COVID was a new normal (Dennis, 2021; Klinenberg & Startz, 2023). Others suggested that technology and the digital age were now a permanent fixture in higher education, but

once incorporated into an institution's mission and objectives, higher education would return to a relatively normal state (Ainsworth & McKenzie, 2020; Ipperciel, 2022; State Council of Higher Education for VA, 2021).

Scholars were interested in whether past program efforts, especially mentoring and undergraduate research programs, might prove effective in the unparalleled challenge of COVID-19 rules and restrictions. The benefits for mentees, particularly those in their first year of university, have been explored in universities around the world (Beltman et al., 2019; Carragher & McGaughey, 2016; Hardt et al., 2022). Mentoring in higher education has been shown to positively influence key outcomes, and peer mentoring, in particular, has been able to increase persistence and retention rates by improving overall psychological well-being, a sense of belonging, and school engagement (Carragher & McGaughey, 2016; Power et al., 2011). There are several distinct advantages that peer mentoring affords relative to traditional hierarchical mentoring approaches, namely, increases in cost-efficiency, greater availability of mentors, and mentor approachability and understanding (Mohd, 2015). The effectiveness of peer mentoring has led to a proliferation of this approach and an increased understanding of its benefits for mentors and mentees.

Student success is defined as being college-educated and is monitored and measured, in part, as the institution's ability to enable students to remain in college (persistence) and to stay enrolled in their discipline by meeting the challenges of the discipline's coursework. Scholarly research suggests that student experiential learning opportunities are highly associated with these outcomes. At CPP, student experiential learning remained a priority. However, these efforts were challenged by the rules, restrictions, and uncertainties of the COVID-19 pandemic. The pandemic crisis significantly impacted the students and the programs, majors, faculty, and institutions. While the consensus is that post-COVID will incorporate some COVID-19 innovations, there is less consensus on whether post-COVID is a major overhaul of higher education or some minor tweaking of how coursework is delivered to students. The COVID years were extraordinary and heightened educators' awareness of the need many students had for support people and resources to overcome adversity and transition to and remain enrolled in college. The role of support staff was taken on by fellow students,

teaching assistants, mentors, etc. These academic "first responders" to the ills that were facing college students during COVID suggest that they had a unique insight into what was happening to students.

Methods

The quantitative design began as a simple pretest/posttest comparison of OUR participation by demographic categories from 2016 through 2022. The pretest period was defined as 2016 through 2019, and the COVID-19 (posttest) period was defined as 2020-2022. The analysis was a comparison of these two periods for demographic factors (Pell-eligible, first generation, white, Black, and Hispanic) and, for three of CPP's eight colleges, STEM status. The analysis compared these two periods using a student's t-test with the assumption that the pretest percentages of participation equaled the post-test. Per se, there was no reason to expect that there would be any difference in first-generation or under-represented minorities (URM) student percentages being enrolled during COVID than during non-COVID years. If the probability of a difference was more than 5% (.05) of the time, it was determined to be statistically insignificant, and the numeric differences between COVID and non-COVID were deemed random or did not represent a bias.

Variables

The dependent variables in the quantitative research are the percentages of low-income (Pell-eligible), (URMs), women, etc., who remained enrolled during COVID and non-COVID years based on publicly available data published by the Office of Undergraduate Research (OUR) and CPP's Institute of Research and Planning (IRAP).

The independent variable is student success projects (see Qualitative Research Design and Methodology section below). OUR students engaged in a variety of experiential learning programs from 2016 through 2022. A research component was part of most of OUR programs. However, the best documentation of what students think of as their research and its consequences was found in a subprogram called Hatchery.

In the Hatchery program experiential research is as broad and varied as the students themselves. Hatchery's students are required to define their research question and indicate why it is important as a critical first step in the Hatchery. During 2021-22, there were 105 students and 41 projects. However, not all projects were "active," and

some were developing a statement of their problem, some paused efforts, and others filed final reports. Table 1 summarizes the 13 engaged and active projects of 2022-2023. Students during this academic year made presentations regarding their research questions and their expected outcomes.

Table 1: *Student Initiated Experiential Research and Importance (Hatchery 2022-23)*

PROJECTS* 2022-23	Students	Objectives	Importance (**bold** = target population)
Modeling **Climate Change** on **Lettuce**	3		**Aid independent lettuce farmers.**
Guatemala Project**	6	Aid to assist poor of San Antonio Agua Calientes	**Mayan households**
PEMF (horse wellness)	4	Electromagnetic field therapy for horses.	**To ease pain of horses**.
Open Lab VR	1	Computer simulation of a laboratory	Provides **students** with **laboratory during COVID**
Masks in Coffee Shops	3	Research on customer's willingness to wear masks	Aid **managers and staff in coffee shops**.
Phoenix Rocket Design /Develop	21	Build a reusable self-landing craft used by students	Reusable self-landing craft for industry
KETO Diet	3	Provide a modified KETO diet to volunteers	**information for healthy sedentary adults**
Automated Solar Tracking	16	Design of solar technology hybrid.	To improve the efficiency of solar power
DITTA	6	To improve the monitoring airplane parts	To perfect an instrument for aerospace industry
BILL-EE	11	Build an automated rover that detects biohazards	To **protect persons in health and public safety**
Use of fluids on body armor	4	Construction of soft armor	Protection for law **enforcement**
Additive Manuf. of Liquid Rocket	1	Employ an AM process for design of engine and parts.	shorten time for building models by students
Velco (Vultures & contamination)	4	Turkey vultures adaptation to pollution	Aid **birds and people** avoid contamination.

* There was a total of 13 projects and 78 students.

It is difficult to narrowly define a project that contributes to community goals. In Table 1, Student-Initiated Experiential Research (within Hatchery) had 13 projects that were designed, developed, and partially or fully completed during the COVID-19 years.

Of the 13 projects summarized above, 11 (85%) were designed to help others. These projects have target populations to be served by the research, which are indicated in bolded text. While some are clearly more altruistic than others, the scope and range of student's interests are impressive. The 11 projects thought to assist others in the community comprised 56 (72%) of the students involved in self-initiated and self-driven projects.

At one end of the spectrum is 'enlightened self-interest.' Students are keenly aware of what their educational limitations and resources are. However, rather than bemoan their fate or switch institutions, they take it upon themselves to provide current and future classes with the opportunities for the discipline that they feel are essential. Examples of 'enlightened self-interest' would be Phoenix 2's design and manufacturing of a rocket-powered lander, Additive Manufacturing (AM) of Liquid Rocket Injectors, and Open Lab VR to provide students with an opportunity to learn and practice safe laboratory protocols as well as experiment with hazardous materials to better understand strengths and limitations of chemicals or materials. The next category of projects could best be described as 'morphing toward community' concerns. While one clear objective in each of these projects is to master a new technology that will be of use in their career (e.g., Climate and CA lettuce, and Coffee Shop Masking), their immediate focus is assisting independent lettuce farmers and coffee shop managers who are walking a fine line between customer preferences and government health and safety regulations. At the other end of the spectrum are projects designed to address the well-being of others, including horses. These projects were inspired and designed to meet specific community-wide goals such as:

- **Guatemala Project****, which, in partnership with *Engineers Without Borders,* provides solar electric power to households in the remote village of San Antonio Agua Calientes. The project enables households to have up to 4 hours of light each evening and to be able to recharge a cell phone.

- **PEMF Horse Project** tested the use of pulsed electromagnetic field therapy to improve the blood flow of horses' legs and thereby enable caretakers to use a less invasive procedure to improve care and reduce the time needed to recover from leg injuries.

- **Keto Diet** is studying the impact of this latest diet trend on more sedentary, healthy, non-athletes to see its impact on the users' motivation, weight loss, and health consequences.

- **BILL-EE** project is to develop, design, and build a prototype rover with a lab that may enter an area with a suspected biohazard and provide first responders, military, or health professionals with information about the fungi and/or bacteria in question without endangering the lives of the responders.

- **Application of shear-thickening fluids on soft body armor** is the development and testing of additives to Kevlar fabric to enable it to stop a high-caliber bullet. These soft body vests are being designed for first responders, prison personnel, and the military to protect them from situations where they encounter persons armed with high-caliber rifles and/or knives.

- **VELCO (Vulture Evolution after contamination)** tracks the death and disease rate of turkey vultures in Southern CA. as a means of identifying areas with high lead content in the air and water. The vultures could adapt to high lead content and/or disappear from areas where the lead content in the environment is fostering their extinction. The tracking of the turkey vultures is also an evidence-based indicator of lead hazards for humans.

Quantitative Research Design and Methodology

The quantitative research design was a pre-test/post-test comparison of factors for non-COVID-19 years (2016-2019) compared to COVID-19 years (2020-2022). The Office of Undergraduate Research **(**OUR) houses a number of experiential research programs, mentorships, workshops, and support programs to help students complete their research and apply to graduate programs. These research-related programs include Achieve Scholar Program for undergraduates **(**ASP) and ASP with Peer Mentors (ASP-PM); Hatchery; Research Through Inclusive Opportunities **(**RIO**)**; and Success and Transfer Articulation through Research and Support Services **(**STARS).

On an annual basis, OUR examines whether the participants from the university's eight colleges are being represented in OUR programs. This analysis uses demographic data collected and maintained by the Office of Institutional Research, Assessment, and Planning (IRAP) on a year-by-year and college-by-college basis. OUR collects participant university identification numbers called *BIDs (Bronco ID)* when students participate in the OUR programs noted above. OUR has IRAP pair the participant's BID with the corresponding data on the student's gender, ethnicity, and

income status. This data is collected and transferred to a data management program and analyzed using t-tests. This statistical test compares the percentages for two groups: the university's demographic percentages and OUR's participation percentages. If the probability that the two groups are the same ($p > .05$), then the two groups are not statistically significant, and there is no bias between these populations. On February 28, 2023, California's Governor Newsom announced the end of the COVID-19 State of Emergency in California. It was now appropriate to test if attendance in OUR during pre-COVID-19 years was on a par with COVID-19 years,

Qualitative Research Design, Methodology and Sampling

The qualitative research was a phenomenological design. The researchers combed the written record of student papers that defined student-initiated research and their expectations for the outcomes. This cause-effect relationship, as perceived by students, was summarized above in Table 1. To explore what students in the COVID-19 years were struggling to overcome, we utilized interviews with peer mentors who were engaged in supporting mentees' persistence and resilience during the challenges of COVID-19. We treated the COVID-19 years as phenomenological and that COVID rules and restrictions were a thing of the past (Creswell & Poth, 2018). The initial research objectives for exploring peer mentor experiences were:

- to understand the peer mentor's influence, mentor's self-efficacy, sense of belonging, and identity within the mentor's major
- to understand how mentor training influenced mentor self-efficacy, sense of belonging, and the mentor's major identity.
- to explore how mentoring-related academic activities (e.g., tutoring, writing center, academic advising) or non-academic activities (e.g., professional development, campus events, community service, university housing) influenced mentors' self-efficacy, sense of belonging, and major identity.

Because the interview phase required direct contact with participants, an IRB protocol was filed with the University in January 2022 and approved by March 2022. Participants were permitted to be recruited directly via emails, flyers, and/or word of mouth. Interested students were to complete an online form to join a subject pool from which they could choose a date and time to participate in the interview process. Personal questions (name, *bronco* ID#, email address) were asked to set up interview

meeting times only. The interview process contained 20 questions that were asked in the same order. Questions about student demographics, motivation, self-efficacy, peer mentor experience, and identity were included. The interview process was recorded and later transcribed. Personal identifiable information collected during the interview was only available to the principal researcher and faculty advisor. In order to maintain student privacy, the recordings were encrypted and stored in a password-protected laptop. Each recording was labeled with a code that was associated with each student ID. The code-ID pairings were stored in a document, also encrypted, and stored on the same laptop. Following the completion of all interviews, which marks the end of the data collection stage, interviews were analyzed, the written component of the study was finalized, and all data (recordings and transcriptions) deleted.

A sample of 15 students has been determined to be sufficient for an exploratory pilot study. Recruitment would be ongoing until 15 participants joined the subject pool. Interviews were conducted while recruitment was still ongoing. Before interviews were performed, study participants read and signed an informed consent form. Interviews would take place virtually via Zoom. Following the interview, students were emailed a summary of the results. Participants could also choose to email the researchers at a later time to get access to future publications regarding the data in this study.

The research narratives that were applied to the interviews for the purpose of this study were:

1. to explore if the motives of peer mentors were similar to what was found in student's research: *enlightened self-interest*, *moving toward* concerns for others *or helping* others,

2. to explore the interactions between mentors and mentee, to understand specifically what mentors and mentees discussed and did together during COVID-19 semesters and how mentors understood the impact of their behavior on the mentees.

Results

The expectation is that pre-COVID-19 years (2016-2019) would be equal to COVID-19 years (2020-2022). Comparisons were made for the following demographic factors: first generation, URM, STEM, males, Hispanic, Whites, Asians, 2 or more ethnic groups, unknown, Black, Pell-eligible, and non-resident alien. Three colleges had STEM-designated programs. Generally, there was no statistically significant difference

between OUR in COVID-19 and the non-COVID-19 years for 7 of the 11 factors tested. However, there were some unexpected anomalies, as seen in Table 2.

Table 2: *Group Statistics for OUR*

	COVID YEAR	N	Mean	Std. Deviation	Std. Error Mean
FIRST GEN %	NO	4	52.0000	0.8165	0.4082
	YES	3	**55.3333**	2.0817	1.2019
URM %	NO	4	39.0000	1.6330	0.8165
	YES	3	**48.3333**	2.8868	1.6667
STEM %	NO	4	77.2500	4.11299	2.05649
	YES	3	**57.6667**	6.11010	3.52767
HISPANICS %	NO	4	35.2500	2.7538	1.3769
	YES	3	**46.6667**	5.8595	3.3830

Persistence percentages increased for first-generation, URM, and Hispanics in OUR during the COVID-19 years. While OUR operated under the same restrictions (social distancing, remote workshops, and collaboration) as the university, students appear to have participated at a higher level for those who were first-generation, URM, and Hispanic. The negative t-test value (see Table 3) is due to subtracting the COVID-19 years' participation from the earlier non-COVID-19 years'. There was an exception that percentages were random or increased. This exception was among percentages who were STEM majors. Here, the participation plummeted significantly – most likely due to the in-person nature of many STEM research projects.

However, while the public data for OUR in COVID and non-COVID years enables us to see if there were significant differences, it does not indicate a correlation or causation. For an understanding of what factors influenced students' choices, the narrative data from student interviews needs to be analyzed.

Table 3: *Statistically Significant Differences: COVID vs. non-COVID years for OUR*

Factor of Comparison	t	Df	Sig. (2 tailed)	Mean Difference	Std. Error
First Generation	-2.988	5	**.031**	-3.333	1.115
Ethnic (URM) percentage	-5.502	5	**.003**	-9.333	1.696
Hispanic Percentage	-3.496	5	**.017**	-11.4167	3.267
STEM Percentages	5.120	5	*.004*	19.583	3.825

Discussion and Analysis

One fundamental issue for peer mentors who served from 2021 through the spring of 2023 was, why they choose to be a peer mentor during a pandemic. These mentors had a commitment to help the mentees. Mentors were well aware that some mentees were *goldbricking;* doing the least a mentee could get away with to take advantage of benefits, such as priority registration and a stipend of about $400 for a semester of 15 weeks. While these benefits were appreciated by mentors, they were not the basis for taking on mentoring responsibility. Most mentors' (N = 11) primary motive was a sheer desire to help the mentees. Seven out of the fifteen mentors expressed a desire to promote the well-being of their mentees as their reason for being a mentor and it was evident that today's mentors were yesterday's mentees.

Peer Mentor's Story

Peer mentors had a deep desire to help mentees and peer mentors were replicating their mentor's behavior when these mentors were mentees prior to COVID-19.

> *And I had an EOP peer mentor that always checked up on me and sent me emails… giving me information. And, I found that very inspiring. And I I wanted to be that person. –* Andrew

> *I'm in engineering ... I spent 4 years at community college, so it was like [an] ongoing struggle to eventually transfer. I had mentors in the past ... they provided, you know, pretty much solid guidance. So, I wanted to try to put myself out there… I tend to be more introverted; observe mentees in terms of their feelings. Being kind of introverted and observing-- guides my approach to*

mentoring. – Brian

I'm a computer science major, [it's my] third year in Cal Poly. I naturally want to help others ... and benefit [from] priority registration, 2 birds with one stone. Most of the time [when] I want to know something, it was like I had to dig [into] a lot of things. That's why I was digging through a lot of things and realized, like, nothing is really okay, everything is put together, but finding where all the folders are ... was the problem I had. I can help … others, like mentees… helping is just a natural thing. I don't like the idea of only benefiting myself. Mutual benefit. Helping others is pretty easy. – Marc

I'm in animal science, minoring in physiology. I met with my peer mentor, she was in the same major, she was the one who encouraged me to apply to be a peer mentor. During COVID I could do this online, which was really flexible for me. I had a research background and wanted to share my experiences with them (mentees). – Vivian

From the mentor's perspective, mentees needed information about who had the information they needed and where information was housed in the bureaucratic world of academia. Mentees needed to learn to ask for help and be their own advocate. The perception of the mentors' view of mentees was reflected in what mentors self-reported they did with and for mentees.

I create[d] a Google Doc for each student, and kind of just as a way to organize each meeting posted there, like action items, two or three action items before the next meeting … [to] hold them accountable. Look at the academic calendar ... throughout the semester, like you're gonna miss a deadline and whatnot; just try to prevent that from happening. We would meet on Zoom; if you are going to miss you can reschedule. – Brian

Brian's response was repeated consistently by other peer mentors. Two aspects of mentoring during COVID -19 restrictions were time and focus. Mentees struggled with managing their time even when time was plentiful, and they did not need to commute physically but could readily jump from one thing to another virtually. The convenience of Zoom-ing was offset by the inconvenience of not being able to physically separate school from family, and work.

… the main thing I could give them, it's just like every [kind of] information they might need. Just because like, there's some things that might help them they just don't know exist. This happens a lot… my role was hand holding, advice, and

guidance… managing time for others, like all the mentees. – Marc

I would give them advice or direct them to specific faculty within the Office of Undergraduate Research where they could better direct questions… the reflections that I got from my mentees is that, like I actually made a difference in their academic careers. And it was because of what I provided to them… different research opportunities, different internship opportunities, or scholarships, and things like that. It was because of [this feedback from mentees] I encouraged them to be peer mentors, and some of them right now are actually peer mentors. – Vivian

I ended up figuring out ways that I could help my mentee, just by providing them with opportunities to get research I sent a whole list of a faculty members that are actively looking for people to do research in that were related to what [the mentee's] interests were. – Hayden

At Cal Poly Pomona, peer mentors were trained in mentoring and knew how mentoring was distinct from being a tutor or being a subject-matter expert. Peer mentors were upperclassmen, trained in their disciplines' research methods, and provided with workshops on a range of topics: defining a research question, literature reviews, presentations, and interviewing. Peer mentors often knew fellow peer mentors. The peer mentor/mentee relationship was about building life skills, not academic ones. For first-generation, Pell-eligible, URMs, and Hispanics, peer mentoring relationships were important to mentees involved in student-initiated research. The data suggested that students persisted and even increased their numbers at CPP. The significant decline was in STEM.

At Cal Poly Pomona, STEM-designated disciplines are in three colleges: Engineering (100%), Science (83%), and Agriculture (60%). All social sciences are in the *College of Letters, Arts and Social Sciences,* and computer science is housed in the College of Business. None of the other disciplines or colleges are designated STEM. We noted from the student-initiated projects (Table 1 above) that among the *enlightened self-interest projects* were *OPEN LAB VR, AM*, and *Liquid Rocket Injectors*. The special lab needs of students were specifically a challenge for STEM fields (biology, zoology, chemistry, and engineering). While students were willing to take the COVID challenge of making their own labs and project substitutes, these efforts were not initiated, completed, and institutionalized to meet student demand. STEM students

were faced with declining resources needed to pursue their disciplines, so their participation numbers declined as well. It is not possible to determine from the public record if other disciplines also lost experiential class resources (labs) to the extent that STEM disciplines lost resources. The data does not report any category other than STEM for Agriculture, Science, and Engineering. However, it seems logical that virtual resources were available for non-STEM studies, which accounts for the unbiased differences and growth between COVID and non-COVID years for all participating OUR colleges and disciplines, with the exception of STEM.

Since peer mentors did not provide subject matter expertise to mentees, The qualitative interviews suggest that the mentees were most in need of information about what resources were available, whom to ask, and how to ask (be an advocate for oneself). Mentors enable students to find their way through the miasma of services, websites, curriculum demands, and so forth. These are soft skills that students need and, in some circumstances, receive during COVID-19. It may have been one of the causes that resulted in our observation that college students were able to remain in college and persist in challenging disciplines.

However, one limitation of this study is that there is a lack of empirical, quantifiable information about the demand for mentees in non-COVID years and the ability of peer mentors to meet these needs. The other limitation of this study is that the public record does not report class hours in labs, fieldwork, project testing areas, and so forth. The availability of resources for disciplines is derived from what students did in OUR programs and what mentors did in support of mentees during the COVID-19 years.

Conclusions

This research initially examined if the participation of URM, low-income, or first-generation categories of MilleniGenZ students differed between the COVID-19 years (2020 -2022) versus the non-COVID-19 years (2016-2019). To test this relationship, the study utilized the public record data provided by the Office of Undergraduate Research (OUR) augmented by college-by-college public data provided by CPP's Department of Institutional Research (IRAP). The findings from the t-test analysis were that most pre-COVID-19 and COVID-19 years participation was random, and unbiased. However,

while some participation increased for first-generation, Hispanics, and URMs, there was a significant and noticeable decline in STEM.

T-tests can indicate that two groups or effects from two time periods are the same or significantly different. It does not indicate why the differences occurred. To explore "why," this study utilized prepared papers of students in self-initiated research projects and a parallel study of peer mentor experiences during COVID. The examination of student-initiated projects revealed that students seem motivated to use their skills to improve the circumstances of others. The peer mentoring study wanted to understand what worked and did not work to enable mentors to meet their responsibilities. However, these narratives also indicated what motivated mentors to undertake these responsibilities during a pandemic and what they did to assist mentees. Peer mentors reported that a significant factor that accounted for their decision to be a peer mentor was that they had been mentees. During 2021 through 2022, mentors also reported that time and focus were the two factors mentees most needed to address. To meet this need, mentors provided guidance in managing time and using online assignment calendars to meet deadlines. To keep mentees focused on their studies and their disciplines, mentors provided information on university resources, internships, and networking opportunities. While none of these resources were proprietary or secretive, mentees needed to know that participation was meant for them.

There is no accounting of how many mentees followed up and applied for programs. Nor does this study provide evidence that having this information was associated with staying in college and facing the challenges of their disciplines. Instead, the narratives indicate that for these mentees, a definite benefit was knowing someone they could rely on who knew where information was and whom to ask. They valued the assistance provided by their peer mentor and would take on the responsibility of being a peer mentor.

Future research is needed to understand how to best pair academic, experiential student projects with soft skill support programs to guide young scholars in the challenging world of academia. This study suggests that while it is tempting to want to find a single policy or program that serves everyone, the diversity among college students makes this infeasible. Instead, it suggests that what is needed is an array of

opportunities and a diversity of former mentees who are now ready to mentor others to use their training and experiences to foster the goals of persistence and resilience for a new cohort of mentees.

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