From Data to Impact: Transformative Internship Experiences for Low-Income, Under-Prepared Engineering Students (Work in Progress)"

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From Data to Impact: Transformative Internship Experiences for Low-Income, Under-Prepared Engineering Students (Work in Progress)

Abstract

This study explores the transformative internship experiences of underprepared, high achieving engineering students identified as need-based (financially). These students were all participants in the Preparing Resilient Individuals for Success in Engineering (PRISE) program at Louisiana State University funded by a National Science Foundation (NSF) S-STEM grant (Award ID 2130581) that promotes academic and career development skills within a high-impact practices framework as defined by the American Association of Colleges and Universities (AAC&U) [1]. The term underprepared was used to operationally define the nature of the students' low access to resources such as career development opportunities (based on the National Association of Colleges and Employers' research-based competencies [2]), social capital and/or network connections, early exposure to higher level core academic coursework (e.g., calculus, physics), and inadequate access to rigorous electives related to their majors (e.g., computational thinking). It is important to note that the students are not underprepared due to their ability or level of academic achievement. The PRISE program was developed to help students by utilizing high-impact practices to improve academic, career, peer, and faculty support. This study utilized a qualitative, exploratory approach (phenomenological design), and 16 participants agreed to be interviewed about their lived experiences through an interview protocol. Analysis included coding, counting code instances and collapsing codes into themes. In total, five themes were found: a) Exploration & Goal Development; b) Internship Acquisition, Roles and Technical Skills; c) Problem-Solving, Challenges and Professional Growth; d) Teamwork, Communication and Mentorship; and e) Self-Reflection, Work-Life Balance, and Time Management. In this presentation, we will highlight experiences, themes, codes, code instances, and participant quotes that demonstrate the findings of this study. Implications and future research directions will be given.

Introduction

The NSF S-STEM PRISE program at LSU is comprised of high-achieving, low-income students who are underprepared in the areas of calculus and/or physics due to a lack of access to educational resources and opportunities. The importance of calculus has been demonstrated in research. For example, calculus and AP calculus were predictors of course completion for an introductory-level college computer science course [3]. Moreover, students who are calculus-eligible when entering college have been found to be statistically significantly more likely to complete their engineering degree [4, 5]. Similarly, Tyson [6] found that high school physics classes correlated with engineering degree attainment; however, Tyson [6] concluded that calculus was the best predictor of engineering matriculation.

Beyond academic preparation, income is also a major and stable predictor of student enrollment and graduation from college, and this inequality remains even with the financial support of Pell grants and scholarships [7]. Working while attending college has been identified

as a major barrier to procuring an internship [8] as have the costs of internship participation such as housing (e.g., when an internship is in another state or city) and transportation to and from internships [9].

High-Impact Practices

According to the American Association of Colleges and Universities (AAC&U), high-impact practices (HIPS) are evidence-based practices that bolster learning and retention for all college students who participate in them but may be critical for students from historically underserved groups [1]. HIPS include such activities as first year seminars, learning communities, study abroad, internships, and undergraduate research [1]. Research demonstrates that the number of HIPS implemented is a significant predictor of student academic outcomes including GPA, degree completion and time to degree [10].

The program is an NSF S-STEM scholarship program, and the faculty used HIPS as a framework for the design. Specific HIPs implemented throughout the program included the following:

1) First-Year Seminars: These seminars included a variety of academic success skills such as time management, academic learning strategies, and academic planning. Career development seminars covered professional resumes, writing and delivering an elevator pitch, mock interviews, career fair preparation, ethics, and the National Association of College and Employer (NACE) competencies [2]. These competencies include Career & Self Development, Communication, Critical Thinking, Equity & Inclusion, Leadership, Professionalism, Teamwork, and Technology. Meetings were held biweekly on these topics. After their first year, students were invited to monthly seminars on professional development topics such as "How to AI-proof your resume."
2) Students were also given additional academic support services including tutoring and supplemental instruction which have been shown to improve academic outcomes [11]. Students were also offered the opportunity to participate in a virtual math bridge program offered by LSU's College of Engineering, Bridge to Engineering Excellence (BEE), in the summer prior to entering college.
3) Students were assigned peer and faculty mentors.
4) Students were encouraged and given support to apply for internships and research opportunities [12], and to become involved in extracurricular activities related to their majors (e.g., clubs, professional organizations). Students have also been encouraged to attend low cost and free professional development opportunities and conferences.

The PRISE program replicates best practices for low-income students which have demonstrated that HIPs can lead to higher student retention and matriculation [13, 14], as well as employment in their chosen field of study [15]. Internships are a focus of the PRISE program as they are a HIP that assists students' overall satisfaction with their major, technical skills development, and interpersonal or soft skills growth [16].

Internships

Internships are an essential learning tool. They provide students with an opportunity to bridge what they are learning in the classroom with the world of work and allow them to further explore their career interests, develop soft skills and technical skills, receive valuable formative and summative feedback, and make mistakes in a supported learning environment. For low-income and first-generation college students (which most of the PRISE scholars are), engineering internships may be crucial for developing professional identity, especially when technical skills are included [17], and internships may increase students' commitment to enter their chosen field of study [18]. Yet, elite internships with the best companies are still elusive for most low-income students who lack social capital and network connections [19].

Students participating in internships may be viewed as more hirable by employers [20]. Interns also have higher efficacy and beliefs about their abilities and preparedness for their future careers than students who do not intern [21]. There is also evidence that students participating in internships receive higher post-graduation pay than those not participating [12]. However, research has shown that low-income and first-generation students are less likely to receive internships compared to their middle-income and continuing generation peers [22, 23]; this discrepancy was shown to be statistically significant when disaggregated by income [24]. Yang and colleagues [23] postulated that the main reason may be structural barriers such as a hidden curriculum of teaching students where and how to apply based on social status, as well as the use of social and familial networks. A major goal of the PRISE program is to assist students with finding elite internships.

To support PRISE scholars with internship obtainment, we began preparing them in their first semester of college with a resume workshop and encouraged attendance at a career fair. The PIs monitored student participation in internships, clubs, organizations, and offered support to students who have not received an internship (i.e., through matching with an industry mentor). We also identified students who may have had difficulty in an internship (e.g., critical feedback on soft skills) and provided support for improvement. Through select interventions and targeted supports, students have successfully gained internships experiences in highly competitive internship placements.

Theoretical Framework

Our theoretical framework for this project was based on Social Cognitive Career Theory [25]. Lent et al., [25] postulated that academic and career goals were largely shaped by an individual's self-efficacy for attaining a specific academic level and career. The authors proposed that, based on Bandura's Social Learning Theory, performance attainment (such as mock interviewing and successful internships), would increase individuals' efficacy and in turn promote behavior that leads to a successful conclusion of their career goals (Figure 1).

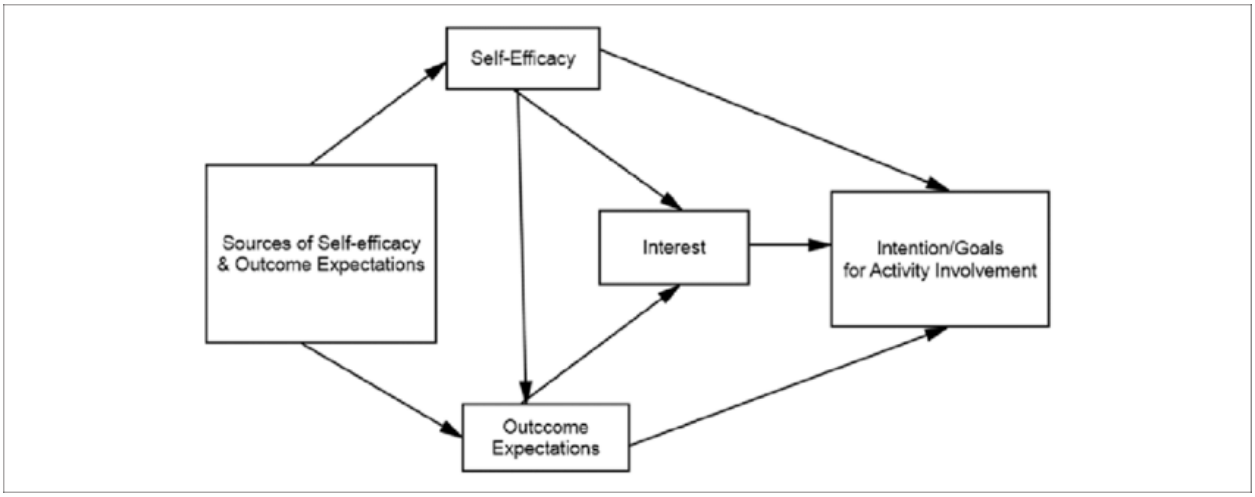

Fig 1. Social cognitive career theory [25]; Figure from Zhan et al. [26]

Research Question

This study was designed to answer the question: *What are the lived experiences of low-income, high achieving, and underprepared bachelor's level engineering students who participated in internships?*

Methods/Design

Because this was an exploratory investigation, the method used to answer this question was qualitative and the design was phenomenology [27]. For this study, 16 PRISE scholars were interviewed and asked about their experiences. All interviews were transcribed, and transcripts were cleaned to ensure accuracy. Using a phenomenological approach, the research team coded all transcripts with both a priori and emergent codes. Codes were discussed in team meetings and then collapsed into thematic categories. Participant quotes that matched the themes were selected for the purpose of demonstrating each theme.

Procedures

Interview protocol was developed based on the research question by one of the co-PIs (see Appendix A for research protocol), and all participants signed informed consent based on IRB approval. Participants were interviewed individually, and interviews were recorded and transcribed. All participants were assigned a pseudonym for confidentiality (see Appendix B Table 1 for participant pseudonyms, gender and race).

Participants

Participants included 16 bachelor's level students in a low-income scholarship program supported by the National Science Foundation S-STEM Program. Over the two to four years that students have participated in PRISE, 84% of the 49 total students have continuously participated in the program. Additionally, nine students have already finished capstone projects.

Inclusion and exclusion criteria. For this study, inclusion criteria consisted of being a PRISE scholar, having completed a minimum of one or more semester-long internships, and agreeing to participate in the interview. The reason for some participants' exclusion was not having had an internship or not agreeing to participate in the study.

Participant demographics. Basic demographics were collected. There were 11 students that identified as white (not Hispanic), two identified as Black, one identified as Hispanic, and two identified as Asian. Regarding gender, 12 participants identified as male and four identified as female. All participants were assigned a pseudonym for confidentiality (see Appendix B Table 1 for participants' pseudonyms, gender, and race).

Internship Placements. Students can get support for finding internships or may choose to apply on their own. The program emphasizes applying for internships early and often. A list of companies that have hired PRISE scholars as interns and the number of internships awarded through each company is included in Appendix B, Table 2.

Findings

There was a total of 398 participants' statements that were coded (code instances), and five themes emerged: a) Exploration & Goal Development; b) Internship Acquisition, Roles and Technical Skills; c) Problem-Solving, Challenges and Professional Growth; d) Teamwork, Communication and Mentorship; and e) Self-Reflection, Work-Life Balance, and Time Management. See Appendix B, Table 3 for a list of themes with codes, code instances, and participant quotes.

Discussion

This study was designed to answer the research question: What are the lived experiences of low-income, high achieving, and underprepared bachelor's level engineering students who participated in internships? Our findings included five themes that emerged (see Findings above). Our findings largely confirmed those of Kusimo et al. [28] who noted that internships positively impact self-efficacy. However, in our study, unlike Kusimo et al., low-income, high achieving, and underprepared students (majority first-generation college students) were able to procure internships at a higher rate than their medium-income peers.

Matusovich and colleagues [20] noted that although career center staff, faculty, and academic advisors believe in the importance of internships, few take action to ensure students understand the value of work-based learning or teach students how to actuate an internship. For our study, the number of internships may have largely been influenced by the focus given to internship procurement and the NACE competencies. Like Seevers [14] the participants with internships in our study articulated a deeper commitment to the profession, self-improvement, and all were retained in engineering.

As noted by Steffen [29], students want internships that lead to real work, and employers often use the internship experience to identify potential entry-level employees. As noted by our

theme Problem-Solving, Challenges and Professional Growth, interns were afforded the opportunity to fail and learn while building resilience. By raising students' engineering efficacy through internships, we can evoke in them motivation to continue when faced with challenges.

Finally, and similar to Lloyd et al. [30], career goals are developed through internship success. Students reflect on their experiences and learn about the types of engineering work that might best suit them. By continuing to pursue their degree, additional internship opportunities, and focusing on new learning goals, students begin the process of growing toward their career goal rather than just taking classes.

Limitations

This study has multiple limitations that should be considered by engineering educators. The first is that the sample was drawn from a program-specific population. These students were all high achievers despite being underprepared and low-income. Further, the students in the study were those who agreed to participate, therefore, it is unknown if more negative experiences would have been captured with all PRISE scholars who had internships. Potential research directions include determining how the NACE competencies prepared this group for internship interviews and internship success.

Conclusions

Consistent with Social Cognitive Career Theory, internships functioned as critical performance accomplishments that strengthened students' self-efficacy, clarified outcome expectations, and reinforced commitment to engineering career goals. PRISE scholars at LSU who participated in the study described gains in technical competence, problem-solving, teamwork, professional communication, resilience, and self-reflection, as well as increased confidence and career clarity. Notably, despite documented structural barriers, and low-income status, participants secured highly competitive internships. This suggests that program interventions that were intentional, early, and which focused on career development and preparation, mentoring, and academic interventions may mitigate inequities in access. Although this study has limitations (i.e. single program and a self-selected sample), the findings highlight the importance of programs that promote equity, persistence, and career readiness among low-income and underprepared engineering students.

References

[1] American Association of Colleges and Universities, "Trending topic: High-impact practices." Accessed September 25, 2025. [Online.] Available: https://www.aacu.org/trending-topics/high-impact

[2] National Association of Colleges and Employers, "What is career readiness?" Accessed September 25, 2025. [Online.] Available: https://www.naceweb.org/career-readiness/competencies/career-readiness-defined

[3] C. Chen, J. M. Kang, G. Sonnert, & P. M. Sadler, "High school calculus and computer science course taking as predictors of success in introductory college computer science," *ACM Transactions on Computing Education (TOCE)*, 21(1), 1 – 21, 2021. https://doi.org/10.1145/3433169

[4] B. Bowen, J. Wilkins, & J. Ernst, "How calculus eligibility and at-risk status relate to graduation rate in engineering degree programs," *Journal of STEM Education: Innovations and Research*, *19*(5), 2019. Retrieved from https://jstem.org/jstem/index.php/JSTEM/article/view/2310

[5] B. D. Bowen, R. A. Hall, & J. V. Ernst, "Calculus eligibility as an at-risk predictor for degree completion in undergraduate engineering," *Technology Interface International Journal, 17*(3), 74-80, 2017.

[6] W. Tyson, "Modeling engineering degree attainment using high school and college physics and calculus coursetaking and achievement," *Journal of Engineering Education*, vol. 100, no. 4, pp. 760–777, Oct. 2011, doi: https://doi.org/10.1002/j.2168-9830.2011.tb00035.x.

[7] J. Klugman, G. D. Arteta, and J. C. Lee, "Income inequality in college enrollment and degree attainment during and after the great recession years," *Socius: Sociological Research for a Dynamic World*, vol. 8, p. 237802312211176, Jan. 2022, doi: https://doi.org/10.1177/23780231221117659.

[8] M. Hora, Z. Chen, E. Parrott, & P. Her, "Problematizing college internships: Exploring issues with access, program design and developmental outcomes," *International Journal of Work-Integrated Learning*, *21*(3), 235–252, 2020. https://eric.ed.gov/?id=EJ1254749

[9] A. Alteri, "You have to pay to play: Housing costs and barriers to participation for student interns," *Higher Education, Skills and Work-Based Learning*, *13*(5), 927–941, 2023. https://doi.org/10.1108/HESWBL-09-2022-0191

[10] A. Ndoye, "High-impact practices and student performance," *International Journal of Teaching and Learning in Higher Education, 35*(2), 115-124, 2023. http://www.isetl.org/ijtlhe/

[11] J. Spedding, A. J. Hawkes, and M. Burgess, "Peer assisted study sessions and student performance: The role of academic engagement, student identity, and statistics self-efficacy," *Psychology Learning & Teaching*, vol. 16, no. 1, pp. 144–163, Jan. 2017, doi: https://doi.org/10.1177/1475725716687166.

[12] K. Powers, A. P. Chen, Krishnaswamy Venkatesh Prasad, Shannon Katherine Gilmartin, and S. Sheppard, "Exploring how engineering internships and undergraduate research experiences inform and influence college students' career decisions and future plans," American Society for Engineering Education Annual Conference & Exposition, 2018, Salt Lake City, UT. doi: https://doi.org/10.18260/1-2--30491.

[13] H. Darabi, R. Nazempour, S. M. Reckinger, P. C. Nelson, R. A. Revelo, J. Abiade, D. Ozevin, A. E. Felder, B. Bilgin, & Y. Siow, "An integrated program for recruitment, retention, and graduation of academically talented low-income engineering students," American Society for Engineering Education Annual Conference, 2020, virtual meeting. https://doi.org/10.18260/1-2--34133

[14] M. Seevers, P. Pyke, W. Knowlton, C. Schrader, & J. Gardner, "Improving engineering undergraduate retention via research and internships," American Society for Engineering Education Annual Conference & Exposition, 2006, Chicago, IL. https://doi.org/10.18260/1-2--1394

[15] S. Goldberger, J. McLaughlin, & N. Snyder, "Mobilizing for opportunity: Connecting low-income college students to internships and good first jobs," Boston Foundation, 2021. https://eric.ed.gov/?id=ED613755

[16] H. Gutiérrez-Pulido and C. Orozco-Rodríguez, "The contribution of professional internships to the academic development of engineering and science students: A case study," *Frontiers in Education*, vol. 10, May 2025, doi: https://doi.org/10.3389/feduc.2025.1563361.

[17] J. A. Yang, J. D. Towles, S. Sheppard, & S. A. Atwood, "Internships' impact on recognition for first-generation and/or low-income students," American Society for Engineering Education Annual Conference & Exposition, 2022, Minneapolis, MN. https://doi.org/10.18260/1-2--40755

[18] S. L. McAlexander, K. McCance, M. R. Blanchard, and R. A. Venditti, "Investigating the experiences, beliefs, and career intentions of historically underrepresented science and engineering undergraduates engaged in an academic and internship program," *Sustainability*, vol. 14, no. 3, p. 1486, Jan. 2022, doi: https://doi.org/10.3390/su14031486.

[19] N. Singer, "For lower-income students, big tech internships can be hard to get," The Chronicle of Evidence-Based Mentoring, n.d. [Online]. https://www.evidencebasedmentoring.org/for-lower-income-students-big-tech-internships-can-be-hard-to-get/

[20] H. Matusovich *et al.*, "Internships and engineering: beliefs and behaviors of academics," *Education + Training*, vol. 61, no. 6, pp. 650–665, Jul. 2019, doi: https://doi.org/10.1108/et-02-2017-0017.

[21] S. Vicente, M. Artiles, H. Matusovich, and C. Carrico, "The role of internships on engineering students' expectations toward their first position after graduation," *Education + Training*, Oct. 2024, doi: https://doi.org/10.1108/et-07-2023-0297.

[22] S. A. Atwood, & S. Sheppard, "Research initiation: The role of internships in developing engineering professional identity for first-generation low-income students," (NSF Award No. 1830761). National Science Foundation, 2018.

[23] J. A. Yang, J. D. Towles, S. D. Sheppard, and S. A. Atwood, "Barbed-wire boundaries: Hidden curriculum, first-generation and low-income engineering students, and internship acquisition," *Journal of Women and Minorities in Science and Engineering*, vol. 30, no. 5, pp. 97–121, Jul. 2023, doi: https://doi.org/10.1615/jwomenminorscieneng.2023046383.

[24] S. A. Atwood, S. K. Gilmartin, A. M. Mostoller, H. L. Chen, & S. Sheppard, "Internship prevalence and factors related to participation," American Society for Engineering Education Annual Conference, 2021, virtual meeting. https://par.nsf.gov/biblio/10284920

[25] R. W. Lent, S. D. Brown, and G. Hackett, "Toward a unifying social cognitive theory of career and academic interest, choice, and performance," *Journal of Vocational Behavior*, vol. 45, no. 1, pp. 79–122, Aug. 1994, doi: https://doi.org/10.1006/jvbe.1994.1027.

[26] D. Zhang, Q. Wang, M. Losinski, & A. Katsiyannis, "An examination of preservice teachers' intentions to pursue careers in special education," *Journal of Teacher Education,* 65, pp. 156-171, 2014.

[27] C. Moustakas. *Phenomenological Research Methods.* SAGE Publications, Inc, 1994.

[28] A. C. Kusimo, M. E. Thompson, S. A. Atwood, & S. Sheppard, "Effects of research and internship experiences on engineering task self-efficacy on engineering students through an intersectional lens," American Society for Engineering Education Annual Conference & Exposition, 2018, Salt Lake City, UT. https://par.nsf.gov/biblio/10076370

[29] H. Steffen, "Student internships and the privilege to work," *Cultural Logic: A Journal of Marxist Theory & Practice*, vol. 17, Jan. 2010, doi: https://doi.org/10.14288/clogic.v17i0.191542.

[30] N. Lloyd, S. Male, & M. Paull, "Strategies to increase equity of access to engineering internships," Australasian Association for Engineering Education, 2018. http://hdl.handle.net/10453/132865

Appendix A. Interview Protocol

1. Where did you complete your internship, and what was your official title or role?
2. How did you find or apply for this internship opportunity?
3. What type of engineering does the company primarily focus on?
4. What were your main responsibilities during the internship?
5. Describe a typical day for you at your internship.
6. Were you assigned to any specific projects? If so, what was your contribution?
7. What tools, software, or programming languages did you use?
8. Did you encounter any technical challenges? How did you approach solving them?
9. Were there any skills from your coursework that helped you during the internship?
10. What was your interaction like with your supervisor or mentor?
11. Did you receive any feedback, and how did you use it to improve?
12. What were the most valuable things you learned during this internship?
13. How has this experience influenced your career goals or career interests?
14. What skills (technical or soft) do you think you improved the most?
15. What did you like most and least about the internship environment?
16. How do you plan to apply this experience in your future education or career?
17. What advice would you give to students preparing for their first engineering internship?
18. What do you wish you had known before starting the internship?
19. Has the internship led to further opportunities (job offers, networking, extended internships)?

Appendix B. Data Tables

Table 1. *Participant Pseudonyms, Race, and Gender*

Pseudonym	**Race**	**Gender**
Timothy Somers	White	Male
Richard Swindon	Black	Male
Chloe Byers	White	Female
Randall Whitley	Black	Male
Linus Bordelon	White	Male
Natasha West	White	Female
Nancy Kushman	Asian	Female
Saryn Seymore	White	Female
Caleb Williams	Asian	Male
Curtis Johnson	White	Male
Travis Moore	Hispanic	Male
Brian Vance	White	Male
Joshua Finnegan	White	Male
Gustav Haraldson	White	Male
Lawrence Savelli	White	Male
Grant Kaiser	White	Male
	11 white, 2 Black, 1 Hispanic, 2 Asian	12 male, 4 female

Table 2. *Companies that have hired PRISE Interns, number of interns hired*

Stellantis (1)	ExxonMobil (3)	NASA Marshall Flight Space Center (1)
Tesla (1)	Textron (1)	Stanley Consultants (1)
Entergy (2)	Chevron (1)	CDI Engineering Solutions (1)
NBC Universal (1)	Pond & Co. (2)	Valero (2)
Ochsner Health (2)	Trace Security, Inc. (1)	Apleona, Ireland (1)
Delek U.S. (1)	Governor's Office of Homeland Security and Emergency Preparedness (1)	
Space X (1)	Citibank (1)	

Table 3. *Themes with codes, code instances, and participant quotes.*

Themes/Codes	Code Instances	Sample Participant Quotes
Theme #1 Career Exploration & Goal Development Codes: Identifying interests & clarifying career goals; Exploring multiple roles/industries; Influence of internships on career goals; Early exposure & guidance; Major switching & career decisions; Long-term career alignment; Future career goals; Career path reflection & planning	57	Saryn Seymore - "And it was a very hard decision for me because I was like, well, really liked NASA. But then the end is the day, the reason I chose to go with Exxon is because I just thought while I'm a student in college, it's like a little trial basically - you go and work somewhere for three months to see if you like it, if you're good at it." (pg. 12) Natasha West - "And then this is definitely a company I could see myself being happy working with for a long time." (pg. 31) Natasha West - "That's kind of why I wanted to intern in a plant too, so that I don't accept a job later down the line and then hate it and be stuck in the job for a year plus or whatever." (pg. 35) Natasha West - "So if I got a return offer for them at the end of this summer, I would probably ask to go into petroleum so that I could try that out before I enter the workforce." (pg. 37) Richard Swindon - "I always had an interest in tech and computer science was just the best way i could expand on that experience"(pg. 1) Linus Bordelon - "Really the main thing I learned was what it takes with the blood sugar and drink water basically, if I can keep the right, then I can do everything else with no problem. LIke if I had mental clarity, if I had the stamina, I could tackle everything that was thrown at me. So in the future, I want to see what limits I can push myself and what more or what new things I like need to discover." (pg. 11) Linus Bordelon - "I feel like the coolest end goal would be able to design all the network patch panels and that kind of equipment, particularly with fiber optics. That part kind of fascinates me in addition to the radio frequencies. So I want to be able to go into designing some of that or just learning how all that is made. But I feel like coursework wise, I feel like I'll learn a lot about that in circuits and some of the later courses. So yeah, I don't think that's necessarily where I want to end up for my career, but just learning how all that works, I feel like that would be valuable." (pg. 12)

		Chloe Byers - “So I really would like to try something in project management and like kind of work my way up there.”(pg. 21) Chloe Byers - “I like from working out here, I realized I’m really into project management. Like I like being able to like oversee everything that’s going on instead of always like just giving my like little chunk and like getting it done”(pg. 21) Curtis Johnson - “It definitely gave me insight that I didn't want to go into like energy. maybe not such a big corporate business as well. But other than that, it's mainly just, I know I don't want to go into like energy or anything.” (pg 11) Randall Whitley - “It has propelled me because this has given me hands on real world experience and solving problems through data.”(pg. 13)
Theme #2 Internship Acquisition, Roles & Technical Skills Codes: Finding opportunities (networking, career fairs, applications); Internship search strategies; Internship roles/responsibilities; Applying coursework; Hands-on technical projects; Use of tools/software; Project/task execution; Software/tools learning; Troubleshooting/independent problem-solving; Application of academic knowledge	97	Timothy Somers - "I've gone to every single career fair since I’ve been here.”(pg.4) Timothy Somers - “But I wouldn't say any like things specifically from my classes, but i would say like the teamwork skills I developed and communication skills I developed, you know, being an engineering student at XXU.”(pg. 24) Saryn Seymore - “So what I did, I spent a whole day in August just to search NASA website, when you go to it, there’s like 300 internships that you can apply to.” (pg. 2) Saryn Seymore - “I applied to 300 of them, you know, hoping I would get at least one yes. And that is what happened. You know, I got like 299 NOs and one yes and that’s all you need.” (pg. 2) Saryn Seymore - “And I think it’s just like a bunch of understanding of physics and thermodynamics, you know, like how do gases work? How do fluids work? Because you know, that all goes into a rocket.” (pg. 4) Nancy Kushman - “Both of them were through just me being on the lookout for great opportunities like these, like on LinkedIn, Handshake as well. And there’s a computer science newsletter that comes out once during the semester weekly. And Breakthrough Tech was an opportunity that was listed there. So that’s where I got that one from.” (pg. 1)

		Nancy Kushman - “For the KPMG, our goal was to build a machine learning model and it was helping a nonprofit org that they knew of to predict future donor behavior.” (pg. 2) Nancy Kushman - “And for me, I was like mostly group coordinator and group leaders. OS setting up meetings, making sure and taking notes for anyone that wasn’t here for the meeting and just making sure everyone knew what they were doing and was able to do. If they needed help, I’ll be able to help them and just make sure that we were meeting our deadlines.” (pg. 2) Natasha West- “I went to the career fair and this company, it’s Oxycam and Geismar, they had actually done an ASME meeting and I was there. And then at the career fair they were like, oh, weren't you at the ASME meeting? And so we kind of connected and talked a little bit at the career fair, and then set up an interview for the next day.” (pg. 2) Natasha West - “There are these two pumps in the plant. It’s a chemical plant that has failed 11 times in the last two years. So I’m designing a new mechanical seal for them and then a new flush for the seal.” (pg.5) Natasha West - “One of my projects is I’m working on making a bolt torque calculator for the engineers because every time they’re installing flanges or anything, depending on what engineer you go to, they might give you a different tightness that the bold needs to be on the flange or whatever.” (pg.5) Natasha West - “And then my last project is serving all the rotating equipment on the plant. So I’m going to every pump, every compressor, every blower, and getting all of the specs like how much is pumping through it, what’s the rate, what’s the material it’s made out of and creating a list for the engineers.” (pg.6) Natasha West - “Last year I was a freshman before, so we really just took the Gen Eds. I didn’t really have a lot of engineering background and I

		was working for a really small firm in Anchorage." (pg. 16) Natasha West - "I would definitely recommend going to the reception the night before so your face is familiar to them the next day. Cause at the actual career fair then they'll take your resume and all that. " (pg. 17) Natasha West - "I think I did like four or five interviews after the career fair." (pg. 18) Natasha West - "But at the end of the summer, we make a presentation and then we present everything that we've done, everything that we've learned and worked on to the corporate office and then also to just all the engineers in our plant, and that determines if we get the return offer for next summer." (pg. 31) Richard Swindon - "So in the beginning, i guess from year 1, I was always looking for internships, always one of that industry level of experience. I was at career fairs early on."(pg. 2) Richard Swindon - "I developed my resume early on and I did end up getting an internship, but it wasn't software engineering. It was cyber security, and that's mainly because cybersecurity is just significantly easier to break into and some experience is better than no experience"(pg. 2) Linus Bordelon - "Mainly digital logic helped me a lot just because I would be able to figure out how to connect things." (pg. 2) Brian Vance - "I just applied to as many things as I possibly could at the career fair, trying to get some different experience, and I ended up getting, I think I got like 4 offers in total." (pg 1) Chloe Byers - "So like there's some niche things, but for me honestly, like being able to problem solve is like the main thing that like I've been able to apply from school…"(pg. 3) Chloe Byers - "And it's just like to me, just like I'm able to like see it from what I learned in class and then apply it to the code"(pg. 3)

		Randall Whitley - “so I actually found my internship within my parishes, within a government portal where you can apply within the parish for jobs. And so I sent my resume and conducted an interviewing process and they found that I was an appropriate fit for the job.”(pg. 1) Randall Whitley - “But I would say that my internship experience has enabled me to implement some of the concepts that I’ve learned in the academic environment, in my academic environment, in my academic endeavours, as well as build the soft skills.”(pg. 4)
Theme #3 Problem-Solving, Challenges & Professional Growth Codes: Technical problem-solving & troubleshooting; Practical/management challenges; Learning through iterative feedback; Overcoming technical challenges; Application of coursework to solve problems; Adjusting to industry vs. academic experience; Gaining confidence/self-efficacy; Adaptability & resilience; Handling pressure/emotional growth; Self-reflection/recognizing strengths	80	Saryn Seymore - “So the biggest difference that I noticed is - there is no topic that you can skip and be fine. You have to understand everything in order to be successful and get the job done.” (pg. 3) Nancy Kushman - “So the difference was the freedom or the range of motion we had with the instructions that we were giving. So we were just given a little bit of leeway to work or have creative mindset here because there was no right or wrong answer while in class there is a right answer most of the time.” (pg. 2) Nancy Kushman - “And also technical side, I got introduced to AI, machine learning and all that and figured out that I do enjoy data analysis and the problem solving side of machine learning a lot.” (pg. 6) Natasha West - “I learned about pumps last year in thermodynamics. We did a little bit of pump work, so it was good having that background in my mind.” (pg. 10) Timothy Somers - “But I think I think that was probably the biggest technical challenge. Yeah, i mean, its just you get used to making mistakes.” Richard Swindon - “It’s been a strong learning curve…I think i’m in my 4th week now fourth or fifth week and the majry of my time has been spent researching and you know, closing that learning curve” (pg. 11)

		Richard Swindon - “And like I said, just the size of the code base and the complexity of it is my main technical issue”(pg. 12) Linus Bordelon - “I had to figure out how to get the wires up and around different things and then make sure everything worked. And then before we even installed the cameras, I had to basically set them up - we had to plus them into another computer and then go through looking up their IP address, connect to them, authenticate them so that they could work with the network, and then configure them to basically make it so that the plant manager is able to view them whenever, wherever.” (pg.6) Chloe Byers - “So like there’s definitely a learning curve, but im really glad like i feel like I’ve grown throughout the internship.”(pg. 2) Brian Vance - “It definitely taught me what I don't want to do. None of them have quite taught me what I want to do, but they definitely taught me what I don't want to do. So I definitely don't want to start a career in management or support. I think they'd be great later in my career when I'm more versed and have more firsthand experience, but they're just not great for me as a starting early career position” (pg 6) Brian Vance - “what that always taught me the squeaky wheel gets the grease, which is one thing, and then you can't beat an in-person interaction. Emails and messages do good, but if you get up and walk up and stand in front of them and they can't ignore you. (pg 3) Caleb Williams - “So the whole internship itself was a huge technical challenge. The hardest part for me was just learning the material itself, learning like the factors that go into oil production and then also learning the machine learning model as well, because that thing is like very intricate itself. I learned enough to the basis where I could present about it and talk about it to the general audience, but there is still so much to learn.” (pg 9) Randall Whitley - “And honestly. I would like to point towards the biggest challenge being, you

		know, the collection itself, that the process of data normalization, which is where like where you take the input, the reports and you adapt it for use to do whatever filtering processing"(pg. 8)
Theme #4 Teamwork, Communication & Mentorship Codes: Group coordination & communication; Collaboration & teamwork; Managing remote collaboration; Navigating conflicts/miscommunication; Mentorship & feedback; Positive learning environments; Networking & professional relationships	86	Saryn Seymore - "But the second one that was also interesting is I had to go and find people would who would build that equipment and, you know, talk to them, find the material. So that was, I feel like very like communication side of the project, because I feel like they want to see that "yes, you're smart and you can do stuff on the computer and understand it, but also you can talk to people and make plants and make business work and stuff like that?" (pg. 3) Saryn Seymore - "But I feel like I realized after getting help and asking those questions, I realized I'm actually being more efficient because I'm not wasting 3 hours trying to figure out some myself when I go ask them and they explain it to me in 10 minutes." (pg. 6) Saryn Seymore - "You know, like they say, no questions are stupid or whatever. So I feel like that was probably one of the most important feedbacks that I've gotten and I'm so glad I got in the very beginning because I feel like that's what made me successful throughout the internship, you know, realizing I don;t have to do it all myself. I can ask questions" (pg. 8) Natasha West - "And my boss is like, I know it feels like busy work, but I promise we will use this everyday." (pg.7) Natasha West - "I talked to a few people like I said, and then we got there and one of the operators is like, "Oh that is a terrible model of pump. Like it's gonna break in a few days;" and I didn't know that." (pg. 21) Natasha West - "As far as pacing on the projects, I make sure to keep up with my boss just checking in and he'll tell me like, oh you should be a little further on this you're ahead on this. And so I'll redirect my focus based on that sometimes, but most of the time it's just keep going." (pg. 27)

		Richard Swindon - “Of course, you can ask for help, but there’s only some, It’s not someone’s now going to be over your shoulder the entire time watching you code individual contribution. And from there you can ask for help, you can ask for direction , you can ask for whatever you may need to get the job done.”(pg. 15) Caleb Williams - “And definitely a thing that still my internship taught me was like, don't be afraid to ask for help at all….because some of these professionals, like at XXU, can be super intimidating and other students may demean you for being stupid or dumb, like asking dumb questions or something like that. But it's like completely the opposite at Chevron. (pg 3) Caleb Williams - “What I did was anytime I needed help, they'd always help me out, even if they didn't know anything, like anything related to my question. They're like, oh, I know someone who I could point you to who can answer your question, and so, I thought that was a good experience, good opportunity to see that like, even if they can't help, they can still somehow indirectly help. (pg 7) Curtis Johnson - “When they gave us feedback, it wasn't very proactive.It was more they were trying to be give us good criticism, but it kind of put us down from time to time.It wasn't communicated well” (pg 8) Curtis Johnson - “Going back to the game chart, because that's like the main thing that they like really impacted me was because so when I showed them the one I originally did, the client, my supervisor, supervisor, he said like that he was disappointed in US. And so like under that pressure, I had to make sure the next one was done correctly. And so that's when I focused up and like used the template they gave me, figured out how to use it and got it done within like 2 days to make sure it was what they wanted…But we just worked as a team and tackle everything as one.” (pg 10) Chloe Byers - “for example, like the one I’m working on, like it’s a new station and there’s a mechanical engineer who had to design all the mechanical where I’m doing like the controls and

		like automating it . SO like we have to work together all the time to do like talk things out."(pg. 4) Randall Whitley - "I would like to give credit to my senior coordinator because he's kind of gotten some of the stuff like some of the legwork like the data collection and excel"(pg. 6) Randall Whitley - "And the guys that work with me, they have a broad expansive knowledge on a lot of things"(pg. 7)
Theme #5: Self-Reflection, Work-Life Balance & Time Management Codes: Self-driven motivation & accountability; Receiving feedback & improving; Time management & prioritization; Work-life balance/personal growth; Self-awareness & resilience; Career clarity & planning; Pride in accomplishments; Routine/planning; Handling workload/avoiding burnout; Persistence & application strategy; Learning from mistakes/reflection	78	Saryn Seymore - "So it was very cool to think about, like something that I designed, NASA is using now." (pg. 3) Saryn Seymore - "But I'm starting to get better at it because I'm starting to realize like I've done this multiple times. Like I've been in the situation where I know nothing about and I've always figured it out." (pg. 4) Saryn Seymore - "So yeah, I feel like I just learned that sometimes you have to go ask questions to be more efficient, you know?" (pg. 6) Saryn Seymore - "I mean, yeah, there's definitely days I don't want to. But every time I do, I don't ever really regret it because, you know, you get a lot done. The hardest part is to get up." (pg. 7) Nancy Kushman - "But through the Breakthrough Tech program and KPMG project and everything, it really solidified my interest in machine learning AI and just data science in general." (pg. 6) Natasha West - "Yeah, it feels great that I'm actually doing something useful." (pg.7) Natasha West - "I would say it's very different from school. I feel like the biggest thing for me has been work life balance. Like for school I am staying up late until the night every night studying and then getting up early in the morning to go to class. But here it's like I'm working my hours and then I go home and it's home time which makes me so excited for actually working in the future." (pg. 8) Natasha West - "I feel like the relationships that I've built, I'm proud of that. Just talking to

		everyone, even if there is a big disconnect like age wise or whatever it is just being more open to talking to everyone because everyone has great input to give and everyone there is so kind." (pg. 39) "If I had to like tell anyone anything, don't, don't do that. Don't take the work home with you. Leave it at work, you know, leave everything you're doing."(pg. 31) Richard Swindon - "I have a hybrid schedule, so I go into the office Tuesdays and Thursdays, but I work Monday through Friday. Monday, Wednesday, Friday I'm at home just working from my home."(pg. 16) Linus Bordelon - "And then also kind of like another part about working that I didn't really think about beforehand, but I had to learn how to prioritize not necessarily my health, but making sure that my blood sugar and my hydration were in the right spot because at first I would just go,go,go,go,go. And then four or five hours later, I would just be so drained just because I wasn't staying hydrated. And I didn't like eating snacks just to keep my blood sugar normal. So that was a kind of a new part of efficiency I didn't really think about beforehand." (pg.10-11) Linus Bordelon - "I feel like I performed my best in just being patient and figuring things out. But I feel like I excelled most in the physical wiring, and we would have these long poles, like the fishing, like not like a fishing pole, but you would fish it through with the pole. I think that I performed best with that and just figured out the best ways to get it over all the insulation, all the air ducts and all that." (pg. 12) Brian Vance - "Just because I feel like I always end up rushing through things, like when I find something that I get the first inkling of, I run with that idea. And it's not always the best. I had written on the whiteboard in my cubicle. I had it written down "SLOW DOWN" for quite a while because it definitely got me into some predicaments early on, but definitely did end up slowing down. And I say that not as a really bad thing, but it's just something to work on." (pg 6)

		Caleb Williams - “And my first few weeks I would try and learn, learn it all by myself, just like absorb all the information you know from those, from the material he gave me, But then I realized this is not effective. And also this is probably not what Chevron is looking for in terms of internships. They'd rather see me learn from other people rather than me just standing, sitting in a cubicle learning by myself. (pg 9) Caleb Williams - “What I would have done differently, honestly, was go around my floor and introducing myself to people just right off the bat rather than sitting in my cubicle trying to learn everything. Just introducing myself, get a face to a name definitely is going to help me in the long run. (pg 23) Curtis Johnson - “So our daily meetings typically were later in the morning, so I would show it to work, and then I might do some school work beforehand, and then go to the meeting and then do work for the company. And then sometimes I'd finish early so I'd do more school work, or I'd start on like a side project or something.” (pg 9) Chloe Byers - “So it's been really like, it’s been really rewarding to like know that like I can come here and like thrive and do good and like be like and put out impressive work even in like a tougher environment.”(pg. 14) Chloe Byers - “So it’s like now I feel more like confident in my technical skills and like maybe going forward doing something else.”(pg. 14) Randall Whitley - “And being able to do this job, it’s very rewarding because it’s a job where the things I’m doing, I feel have a positive contribution on my community” (pg. 13) Randall Whitley - “And so when it comes to when I get home, you know, I go for a run and practice self-care. And I’m really in the stage of my life where I’m trying to , you know take this energy and put it back into myself.(pg. 12)