



Reflections on an Introduction to Project Based Engineering in an Incarcerated Setting

Rob Sleezer (Associate Professor, Twin Cities Engineering)

Rob Sleezer serves as an associate professor in the Department of Integrated Engineering at Minnesota State University, Mankato. As an active member in ASEE and IEEE Rob works to connect the learning of engineering to the practice of engineering. He supports learning across the breadth of electrical engineering and facilitates a seminar where student engineers engage in design and professional learning.

Nicolle Revello

Morgan Round

Kristen O'Connell

Benjamin Orlin

Andrew David Roberts (Professor)

Reflections on an Introduction to Project Based Engineering in an Incarcerated Setting

Abstract

Education programs in incarcerated settings have a goal of improving the current and future lives of the currently incarcerated individuals. Many programs support earning a GED, associate degree, or baccalaureate degree when incarcerated. The benefits of these programs include improved behavior while incarcerated, reduced recidivism, and broadening the workforce. Generally, the courses offered as a part of these programs are general education in nature.

This paper discusses an Introduction to Project Based Engineering taught in a women's prison setting. Specifically, it explores the course as a case study reflected on from several angles. Each reflection illuminates the case from a different perspective. The different perspectives are a prison administrator, the instructor, the author of one of the textbooks used in the course, a student more than a decade from release, and a student a few months from release. By taking these reflections together one can see the challenges, rewards, and opportunities associated with teaching an Introduction to Project Based Engineering to incarcerated women.

Although each perspective highlights different aspects of the course there are common themes. There are also key differences that illustrate the unique needs and wants of the various stakeholders. The common themes and differences are identified. Together they serve as a foundation for adjusting the course to make it more effective and sustainable. Additionally, the reflections examined here shed light on how an Introduction to Project Based Engineering in a traditional setting might be improved.

1. Introduction

Offering a university-level engineering course in a prison for the first time can be compared to an expedition. Examining such an experience encourages considering new spaces for engineering education, inspires opportunities for improvements in traditional settings, and highlights the impact of incarcerated education on all stakeholders. In this paper, we report on the journey that was taken by a group of people for the express purpose of offering a popular engineering course in a women's prison. Specifically, this paper describes an exploratory case study that includes reflections from six people, all authors of this manuscript, who participated in the expedition. The case setting is the Introduction to Project-Based Engineering offered at the Minnesota Correctional Facility – Shakopee (MCFS) as part of the Scholars Serving Time (SST) program. Next, we describe how we prepared for the journey.

1.1 Background: Preparing for an Expedition in Correction-Based Education

Before embarking on an expedition one must ensure that the trip is worth taking. To gain that assurance, we examined the literature. A full exploration of that literature is beyond the scope of

this paper; however, the following paragraphs report on terminology, benefits of inmate education, opportunities for improvements in inmate education, and gaps between what is known and what is unknown about teaching university-level engineering education to incarcerated students.

1.1.1 Terminology

The *U. S. correctional system* is a collection of *correctional institutions*, including prisons and jails, whose purpose is to punish for the purposes of rehabilitation, incapacitation, specific deterrence, general deterrence, and denunciation [1]. In 2019, federal and state prisons incarcerated more than 1.4 million adults and released more than 600,000 individuals to return to their local communities [2]. What happens to the individuals who are released? Some integrate into their community; some commit crimes that require reincarceration.

The U.S. Department of Education, an entity that funds many educational programs for inmates, defines *correctional education* as: “a fundamental component of rehabilitative programming offered in juvenile justice confinement facilities, most American prisons, and many jails and detention centers” [3]. Consistent with this definition, *prison education* is defined in this paper as a subset of *correctional education*. Thus, statistics on *correctional education* include *prison education* information. *Inmate education* can occur in a prison or another type of correctional institution. Although this paper focuses mainly on adults in prisons who take one or more college-level courses, the literature review includes both *correctional*-and *prison-education*.

1.1.2 The Benefits of Inmate Education

This section describes the effect of correctional education on incarcerated students, course instructors, correctional facilities, communities, and society as a whole. First, we focus on benefits for incarcerated students.

Simply stated, correctional education can transform students [4]-[6]. For example, recidivism, one of the most studied effects of correctional interventions, decreases with increases in education (for examples, see [7]-[11]). RAND research revealed that incarcerated adults who participated in a correctional education program while in prison—whether it was adult basic education (ABE), general equivalency diploma (GED) preparation, college education, or vocational training or career technical education (CTE)—had a 13-percentage point reduction in their risk of recidivating after being released from prison. The same research revealed that inmates who participated in college programs while in prison were about half as likely to recidivate as those who did not participate in any type of correctional education program [12]. These outcomes hold when the population studied consists of women who enrolled in college-level courses prior to their release from incarceration [13].

When examined independently, the anecdotal nature, lack of control, and limited transferability of individual studies raise questions about the effect of inmate education on recidivism [14]. However, several meta-analyses support the broad claim that education reduces recidivism (see

for example [14]-[17]). Because employment is key to lowering recidivism, that topic is discussed next.

Lois M. Davis, a Senior Policy Researcher with the RAND Corporation, stated “Being able to land a job can mean the difference between successfully transitioning back into a community and returning to prison” [12]. Education leads to a higher probability of post-release employment [7], [9], [18], a claim that was also supported by meta-analyses [15], [17], [19].

In summary, Davis reports that higher education programs in prison are effective—and cost-effective—at improving employment outcomes for participants and at helping to keep formerly incarcerated individuals from returning to prison (i.e., recidivism) [12]. Lowering recidivism, in turn, improves communities through better public safety and lower taxpayer costs. Davis conservatively stated in 2019 that “every dollar invested in prison education programs saves taxpayers, on average, between \$4 and \$5 in three-year reincarceration costs.”

The positive effects of correctional education extend beyond reducing recidivism and increasing post release employment [20]. Sarah Moore and Tanya Erzen, who recently studied the impact of higher education in prison, stated that higher education in prison is most often evaluated based on lower recidivism and post-release employment, that these results are critical, and, furthermore, that higher education “confers much broader cognitive, social, psychological, and skill-based benefits that impact students well before their release. Moreover, these impacts are likely to mediate the relationship between higher educational experiences on the one hand and post-release effects on the other” [21].

For individuals, inmate education positively influences inmate motivation to seek a better life [22] and provides confidence to seek better relationships [23]. By engaging students in ethical communication, prison educators encourage learning in the so-called “soft skills” needed for success in public spheres [24], [25]. For example, correctional education helps incarcerated students develop the critical thinking and communication skills that enable them to face future situations more effectively [26]. Additionally, because many incarcerated students are parents and parental education is indicative of child education level, correctional education has a potential for generational change [27], [28]. For prisons, the benefits of college education programs include less violence among incarcerated individuals, which, in turn, results in safer environments for both incarcerated individuals and prison staff [29].

For instructors, teaching a college course in prison has many benefits. On a survey of faculty perceptions, most faculty respondents indicated that they were either *satisfied* or *very satisfied* with teaching in prison [30]. Furthermore, many who taught in prison reported the experience to be personally transformative [6], [31]. In addition to providing a connection to the outside world for incarcerated students, faculty provide information about the prison experience to the general population [4]. Faculty also report a positive effect to their professional identities [31]. These trends appeared to hold when looking more narrowly at the STEM fields with a practitioner teaching math in prison and jail indicating that the experience was both productive and rewarding [32].

For society, correctional education offers many benefits. For example, society is improved when incarcerated individuals re-entered it with knowledge and hope [26]. Interestingly, Bazos and Hausman's research compared two crime control methods: educating prisoners and expanding prisons. They found that one million dollars spent on incarceration prevents 350 crimes, but that same amount spent on correctional education prevents about 600 crimes, and they concluded that correctional education is almost twice as cost-effective as incarceration in controlling crime [33].

Davis, et al. examined the cost of correctional education programs compared to the cost of incarcerating individuals [34]. They calculated that the per participant cost of correctional education is \$1,400–\$1,744 and that the average savings per participant from reduced reincarceration rates is \$8,700–\$9,700 over three years. Using the highest average cost (\$1,744) and the lowest average savings (\$8,700) provides a three-year return on investment for taxpayers of nearly 400%, or \$5 saved for every \$1 spent.

1.1.3 Opportunities for Improvement and Gaps in Knowledge

The literature identifies opportunities for improving inmate education as well as gaps in current knowledge. For example, improvements are needed in instructor training and preparation [20], [35]. Specifically, faculty preparing to teach in an incarcerated setting should research the realities of the setting to counteract popular misconceptions [36].

Although correctional education is in many ways the same as traditional education, some key differences exist [37]. These differences necessarily affect instructional approaches that are selected. Like a regular classroom, academic preparation and readiness of incarcerated students is a key to success [38]. As a result, some incarcerated students may need remedial instruction [39]. A particular area of need for many incarcerated students is metacognition to support their development from dependent to independent learners [39]. Thus, while traditional education focuses on knowledge, skills, and attitude in that order the priority in prison should be attitude, skills, and then knowledge [40].

A key to achieving academic success in a correctional setting is developing trust in the classroom. Building trust includes acknowledging the power imbalance between the course instructor and the students that could exist because of race, gender, or position; providing academic success opportunities for students who are disenfranchised because of their prior schooling; and creating a respectful classroom environment [41], [42]. Furthermore, when instructors model strong learning behavior they can inspire enthusiasm in their incarcerated students [40]. Said differently by Annie Raymond who taught Mathematics in prison and jail, “if you treat inmates like students, they will become students – and often surprise you and even become scholars. They will become inspiring agents of change whom we want to see out in our society” [32].

Both universities and prisons share the objective of transforming individuals, so a natural opportunity for cooperation exists [43]. However strong correctional education programs require substantial negotiation. Success depends on communication between the stakeholder

organizations at all levels [35]. Developing a shared mission, vision, and goals for educational programs in women's prisons could improve organizational cohesion [35].

According to Moore and Erzen [21], the literature has begun to address the gap in research on higher education prison programs between how students describe their experience in such programs and the existing research that focuses on how a higher education in prison program is an intervention-based treatment, beneficial to the extent that it results in employment or reduced recidivism. A particular gap in correctional education occurs in the area of STEM education. A 2010 study found opportunities for better integration of STEM in postsecondary correctional education [44]. We found no research-based information that described an engineering course offered in prison.

1.2 Summary

Overall, the literature on correctional education supports taking this expedition for three reasons. First, the transformations of incarcerated students, prisons, instructors, and communities due to education are not fully understood. Second, clear opportunities for improvement exist in offering prison education. Third, a gap exists in the knowledge of prison education that could be informed by this study. Specifically, this expedition focuses on the gap in knowing how participants describe their experience in a prison education course that teaches an introduction to engineering.

2. Research Methods: The Expedition Plan

This section describes the specific project plan for the expedition. It describes who is involved, how they are involved, and what artifacts are examined.

2.1 Who is involved in the Expedition?

Not surprisingly, many individuals had a stake in the process and outcome of the engineering course. The study's first author invited individuals to participate in developing this case study if they communicated insights about the course during its implementation, could easily articulate their views, and cared about the course.

Russ-Eft, Preskill, and Torres [45] describe three levels of stakeholders: Primary stakeholders are the people who make the research happen (e.g., funding agencies, staff), secondary stakeholders are affected by the study and interested in the outcomes" (e.g., administrators, study participants), and tertiary stakeholders have an interest in the study's results (e.g., professional colleagues, community members). Table 1, which depicts the roles of authors of this case and their stakeholder level, reveals that the authors of the case study represent all three levels of stakeholders.

Table 1: Matrix showing stakeholders and their stakeholder level with author roles bolded.

	Primary Stakeholder	Secondary Stakeholder	Tertiary Stakeholder
Course Instructors	x		
Prison Administration		x	
Future SST Instructors			x
Students in the Class		x	
Students in Future Classes			x
University Administration		x	
Textbook Authors			x

2.2 What Type of Research is Conducted?

We chose case study as the research methodology for this paper. Yin suggested that case study methodology be used when the main research questions are *how* or *why* questions, the researcher has little control over behavioral events, and the study's focus is contemporary [46]. We chose case study methodology because all three suggestions are present in this situation.

Yin also identified five important components of case study research design “1. A case study's questions; 2. Its propositions, if any; 3. Its unit(s) of analysis; 4. The logic linking the data to the propositions; and 5. The criteria for interpreting the findings” [47]. We describe each component in the paragraphs below.

In this paper, we asked the research question “How do people who had various stakes in the Scholars Serving Time program at the Minnesota Correctional Facility – Shakopee (MCFS) perceive the Introduction to Project-Based Engineering course?” As the only known implementation of a project-based engineering course in a correctional setting, this course represents a unique opportunity for study. This exploratory case study has no propositions.

2.3 Where is the Research Set?

The unit of analysis for this study is the Introduction to Project-Based Engineering course that was offered in the Scholars Serving Time program at the Minnesota Correctional Facility – Shakopee (MCFS) during Fall Semester, 2021. MCFS is a women’s prison that houses incarcerated individuals who have been convicted of offenses ranging from property damage to homicide [48]. Specifics of the course are that it was taught in person to nine incarcerated students who met with the professor twice a week for two hours each week during the semester. The intended class size was 22; however, due to COVID-19 restrictions, course participation for the offering was limited to nine students.

The syllabus specified the course objectives, which were to grow awareness of engineering as a profession; begin developing competence in professional, design, and technical skills; and to refine, practice, and grow independent learning capacity. One meeting each week was dedicated to theory or discussion while the other meeting was dedicated to experiential learning.

Course grades include participation, weekly summaries, a group project, and an individual presentation. Assigned readings include *Crucial Conversations: Tools for Talking When the Stakes are High* [49] to support professional learning; *The Design of Everyday Things* by Don Norman [50]; and *Math with Bad Drawings* by Ben Orlin [51] to support technical learning.

The course instructor is a male, 42-year-old, tenured Associate Professor of Integrated Engineering at MSU. He has not previously been to prison or worked in a prison.

The data of the case are linked to the proposition through a temporal analysis where the narratives are examined for sentiments about effects before, during, and after the course experience. Each narrative is provided in full and the findings of the case are interpreted through a case description.

3. Reflections: Understanding the Expedition

Here, everyone who participated in authoring this paper reflects on the course implementation and outcomes.

3.1 Instructor

A full exploration of my prison teaching experience exceeds the space available so, instead, the following paragraphs will highlight four facets of impact. The first focuses on my experience preparing for the course. The next focuses on building a productive relationship with incarcerated students. The third touches on observed student growth in design, technical, and professional skills. The final highlights my growth journey during the class. Although far from painting a complete picture these paragraphs provide an overall picture and some detailed context about my experience.

First, preparing for the course. The design this course forced me to work in slightly uncomfortable spaces. I typically approach education through inquiry and discovery by working to connect the natural curiosity of those around me to either thought experiments or real experiments. Thus, my classes often pivot quickly when questions are raised. Such pivots often include someone running to the lab to grab the parts for an experiment or seeking information to fill knowledge gaps of the group. The restrictions of a prison classroom preclude both approaches: no lab existed and internet was unavailable to students. As a result, I designed this course much more intentionally so I could arrange appropriate materials in advance. Although the course was originally scheduled for a single two hour meeting each week, I arranged for a second meeting. In the first meeting of the week, I facilitated a discussion, leaving the second meeting for the practice of engineering. The limited engineering toolset, all materials had to be approved by the warden, forced me to be creative in selecting activities and projects. Most activities were modified versions of lessons used in K-12 spaces, while the large semester project was to design and model an elementary school. Although having such a rigid structure pushed my boundaries, it positioned me well for operating in the correctional education environment.

Second, building productive relationships with students. I built productive relationships with incarcerated students using many of the same tools I use to build productive relationships in other spaces. At the same time, I needed to be concerned about the possibility of inappropriate manipulation. By explicitly describing my background including some details of my personal life I humanized myself while at the same time removing potential points of leverage for manipulation. Over the course of the semester, I cultivated the seeds planted in this first meeting through appropriate disclosures about my life outside the prison walls, actively listening to the experiences shared by the incarcerated students and partnering to improve both ourselves and the world. All class participants grew and changed in ways that would not have been possible if I had focused purely on content delivery.

Third, student growth. At the start of the term, nervous students walked into a classroom apprehensive about the technical expectations of an engineering course, not knowing they would walk out more confident about their technical capability and also their design and professionalism skills. Through activities and project work the students practiced applying technical learning in a design context. Additionally, most activities required collaborating with colleagues in a productive way. Given a balance of technical, design, and professional content in a safe space for practice and reflection the incarcerated students grew in multidimensional ways. Examples include effectively applying recently learned knowledge of trusses to constructing chairs from newspaper and masking tape in small teams or designing an elementary school while considering the needs of multiple constituents. Importantly several students were able to transfer their learning into other contexts such as improving their living situation or interacting with their loved ones.

Forth, instructor growth. I personally grew during the experience of teaching in an incarcerated setting. Connecting with the creative, strong, and intelligent women in the class led to new perspectives enabling me to both teach and engineer more effectively. Also, the practice of considering what to teach and how to teach in such a restricted environment helped me focus my

thoughts the best ways to approach engineering education. Further, my surprise at the student's excitement about seemingly small things (such as when I posted a picture of someone using a chair they made) caused me to reflect more deeply on many experiences I had started to take for granted.

3.2 Future Instructor of Physics

I have been teaching physics courses to a students with a wide range of experience and expectations for over 25 years. While most dedicated academic instructors understand the value of exploring new methodologies in teaching, both to reach different students and to more effectively promote mastery of the subjects in others, there are rarely reasons to truly reevaluate why we do what we do. This is one of the primary challenges that drove me to volunteer to teach in the prisons system.

I have agreed to teach Physics 101, a lab based, conceptual physics course in a local federal prison. This class is offered at our institution in a variety of formats for primarily non-science majors fulfilling their general education requirements for graduation. Despite the range of classroom experience I've had for this course, 5-15 weeks, 15-350 students, numerous teaching and evaluation modalities, there has always been a commonality I could rely on. I know when I teach I have a well-stocked lab, a wealth of potential demos to perform, and seemingly simple things like internet access and general supplies. The course by nature covers a broad range of topics from Newtonian mechanics to special relativity, and it's easy to be flexible in how things get presented, following the whims of the particular student cohort. There is more preparation involved in setting up for a prison course. While lecture flexibility is still reasonable, the preparation for labs is necessarily more proscribed. As a new professor in this environment, much of the preparation involves learning what the boundaries and restrictions are. What items are restricted? Who needs to know what equipment I will bring and when? How do the logistics of setting up labs for a given day work, do I need to provide all the equipment for the term at once?

It may seem that the challenge of teaching in prison would primarily be one of early planning and organization. I believe it is more than that, and presents an opportunity to really question what it is the course is trying to accomplish. Each lab activity must be stripped down to the key components, and prioritized by the value of the lesson. Kinematics can be taught with nothing more than a ball and a stopwatch, but how do we effectively craft the student lab experience around these limited resources? Will this environment need a reevaluation of topics covered? How do we best achieve the course objectives while minimizing the resources needed?

These questions will be required to effectively teach incarcerated students, but I believe this is an exercise that will benefit students in all classes. Why I teach something and how it is most effectively learned should never be taken for granted, nor should it be driven by the available resources or technologies. Teaching in a restrictive prison environment is a great opportunity to reprioritize what really matters in physics education.

3.3 Student 1

The Introduction to Project Based Engineering course challenged me in many ways. Some challenges helped me grow in positive ways while other challenges caused great frustration with little gain. The following paragraphs touch on many aspects of the course and how the experience impacted me.

What worked well for me was the amount of engagement, open-dialogue, humor and vulnerability expressed by our teacher. I felt comfortable asking any question. I wasn't expecting that from a 'Professor of Engineering'. In fact, I was intimidated as soon as I saw it on my class schedule but was relieved two minutes into our first class. He gave everyone a chance to feel heard and important. The content was helpful and I think the chosen books were smart ones. I loved Ben Orlin's 'Math with Bad Drawings' [51] and we all got to meet the author and received a signed copy of his 2nd installment. (Rob's a wizard.) Also the weekly readings were carefully tied into the following weeks' planned discussion where I could ask questions and go deeper and deeper until I understood the concepts. For me the most impactful activity was when Ben Orlin, a math teacher and author of one of our required texts came into talk with our teacher Rob, an engineering teacher about the correlation, similarities, and differences between engineering and math and how the two work together and how they don't. We could ask one question and get a different but still correct answer from both of them. It was exciting, entertaining, enlightening and comical to watch the two banter back and forth, agree and disagree. I learned the most that day because Ben followed Rob's lead and answered any questions we had to the best of his ability. I think it will probably be one of my favorite memories. I felt like a lady. A smart lady. A smart lady that was worth these twos' time. This class was life changing for me. My emotions as I participated in class were definitely fluctuating on a regular basis. Some not so helpful core beliefs that I thought I'd laid by the wayside reared their ugly heads at times which I think is 'normal', right? It was the most difficult class for me and also the one that I gained the most from. No growth happens in our comfort zone and I try to live 'on the edge of my ability', (most of the time...lol).

What did not work well, for me, was that sometimes certain students used the openness as an opportunity to get on a soapbox/practice manipulation techniques that the more seasoned prison staff are used to which in turn ate up valuable lecture class time. Repeated stories of complete innocence of their crime/victim stance and attention seeking from a sympathetic person in the outside professional community. These same students did this to all the teachers with the same lines and sad stories about prison life, most of which were exaggerated and/or fictitious. Making it seem like we are never heard etc. Some of the smartest women in the prison are in this program and some of the most manipulative. We are heard. We are guilty. Yes, I can go into ACE scores, stories of trauma, socioeconomic disparities, marginalization all day but that wasn't the time or place, that is for your therapist- not your college professor. I know because I used to be that way too. I didn't grow, learn change or benefit myself or anybody else until I took responsibility for MY ADULT CHOICES. The therapists here don't coddle us, they know better. I got frustrated many times when the teachers were so easily manipulated during our precious class time. I found myself losing steam halfway through the semester.

When you say the word 'engineering class' people pay attention, that word alone helped to bridge a gap of communication between me and my Father, it gave him hope for my future because I had received a scholarship and because I was in an engineering class. I would tell him, "Dad, it's super basic, like intro to engineering" and he would say, "Nic, it doesn't matter, it's engineering, okay?" I would be so hype after class I would walk as fast as I could back to our living unit and call my boyfriend to tell him about everything I learned that day, I started believing in my life's possibilities again.

One of the ways the environment prevented me from being more successful was working in groups. From covid restrictions within the facility and available time to spend working together to one of my teammates going in and out of a psychosis, it was beyond challenging and stressful. I ended up writing the final report for our group of three and got an 'A' so I was happy. Looking back there were times when I could've behaved or spoke differently within my group and although I learned from the experience I don't believe this is the right setting for group assignments. It was not a good experience at all for me. I did overcome the challenge of working on a team by writing the final report myself but it was also a highly stressful time. I was also embarrassed by our final project model and presentation and I must admit that I didn't put my all into it but had given up on it and put most of my attention into the final report.

3.4 Student 2

I am currently an inmate at the Minnesota Correction Facility - Shakopee and this program is something that has improved me in many different aspects of my life. I am going to start by discussing my overall experience being in this engineering course while incarcerated. Next I will describe how this course has made me self-reflect and improve myself. Third I will share how I've been working on amending my personal relationships and finally how I am going to apply this vast amount of knowledge moving forward. My hope is by sharing this, this can help people gain insight into how beneficial this class has been to not only myself but other incarcerated individuals as well.

My overall experience of the Engineering course was at first very overwhelming! I had graduated high school and have been out of high school for over 5 years, so going back into the classroom was pretty intimidating! I was worried that my drug use had effected my psyche, and then to start college with an intro into engineering class? I thought to myself "Great! Here goes the whole semester!" I was worried about what our professors would think of me and my fellow classmates, just like I'm sure they were worried about how we would act, if we really looked like inmates, what we were here for and how long we had been here. Once we met our Professor, I was still careful about what I said and how I said it. I am an open book, and how are we supposed to communicate effectively without feeling comfortable around one another? In our first couple classes together the professor took the time to sit down and actually listen to us, and gave us the opportunity to share whatever we felt was important for him to know, or needed to know. In doing this made me so much more comfortable because it actually gave us a voice, and it made all of us students feel like we were actually being heard. With our professor doing this allowed us to open up and feel that comfortable feeling to then start an effective teaching and

safe communication setting. Whenever we, as students, needed extra help with anything we were learning or reviewing over, there was never a moment I felt that it wasn't okay to say "Hey, I just am not getting this."

One of the main things we learned about in this engineering class was effectively communicating your feelings you may have, and we also focused on adaptability. Being in a prison you are subject to many different cultures, backgrounds and upbringings. In prison you are at times forced to have very tough, crucial conversations. In the classroom, we learned how to communicate feelings and emotions in a positive, conducive manner from the "Crucial Conversations" [49] book that our professor had assigned us to read. We would read from the book and then come to class and partake in different scenarios depicting what would be the worst/okay/best possible way to communicate in that situation. That book also taught me to always consider my audience. Consider the other person of my crucial conversation and always try to see where they are coming from, and validate your feelings as you would want someone to validate your own feelings. Going over real life situations made me see and learn the most effective way to communicate in the situation I am in.

In engineering there is a lot of on-the-go problem solving and thinking, and in this class here at the prison there was A LOT of that we as inmates and students had to face! When we first started this program, we did not have our tablets up and running yet so we could not do certain activities or read along as planned, and so the professor had to print off everything or just mainly focus on the books we were reading at the time. In the classroom there was not a projector or a computer screen you could follow along with, so we would go off of actual physical copies of slide-shows or most of our classes were very in the moment type teachings. We had very active discussions along with hands on activities. Anything our professor wanted to bring in had to first be approved by the DOC (Department of Corrections.) We also learned as a class that it does take a while for things to get approved so we now know how to ask for whatever materials we may need WAY ahead of time. For example, our final project in this engineering class was very hard to pull off, given all the limitations we faced. The professor placed us in groups for our final projects, and that proved to be very challenging. Outside of the classroom we had to fight very hard for time to work on our group projects, while also being respectful of the other inmates and their day-room times. We had to reach out to the education staff along with our professor's help and have the education staff organize with our living units and set aside approved times to work together with our groups outside of the classroom. Outside of the classroom we were only able to work on the reports and outline portion of the group projects. The materials we were building our school with could NOT be taken out of the classroom, and if it was it was then considered contraband and you may receive disciplinary actions for having that item. Due to this being a major factor in our outside the classroom life we lived, a good portion of our classroom time was taken up to make these school models with our groups.

3.5 Textbook Author

I don't recall what audience I had in mind while writing *Math with Bad Drawings*, but "incarcerated women in a project-based class taught by a hyperkinetic engineer named Rob" was

not it. That's for the best: knowing nothing about life inside prisons, I would surely have missed the mark had I thought to aim for it.

I don't know why my book spoke to these students. At first I thought it was the wide variety of applications—architecture, astronomy, cooking, paper design, etc. For most readers, this makes math feel closer to the world. Perhaps, for these readers, it made the world feel closer to them. But having spent a few fun and memorable hours with the class, I now suspect it was something simpler. Whereas many math books are written with an air of distant omniscience, mine is clumsy and personal, full of smudges and fingerprints and misshapen stick figures. In spite of the book's flaws—and because of them—you can tell a human being wrote it.

Incarceration takes human bodies as objects to control. Math and engineering classes tend to do something similar with human minds. Perhaps the success of this project-based course—and of my book's small role therein—is that it made space for everyone to be human for a while.

In the past, having heard from friends and colleagues who taught in prisons, I idly thought of doing the same myself. I'm hopeful that this experience will give my lazy bones the shove they need to take real action.

3.6 Prison Director of Education

According to The Center for American Progress, “Individuals who did not complete high school were rearrested at the highest rate—60.4 percent—while those who had a college degree were rearrested at a rate of 19.1 percent” [52].

The ability to go to college for free is something that many individuals strive for. The ability to go to college for free inside the walls of a prison is something incredible for the selected individuals. Our hope is that every individual that walks into the doors to prison will take advantage of the educational programming that each facility has to offer.

In the Fall of 2021, the Shakopee Correctional Facility was excited to pilot a full-time Minnesota State accredited associate degree program through Minnesota State – Mankato that utilized American Prison Data Systems tablets for the students along with face-to-face, hands-on instruction.

I have served as an Education Director at the Shakopee Facility since 2018. We have had college programming here in the past. However, this full-time program was a first of its kind as it was full time, during the day and the students that applied and were accepted, were assigned this as their job in the facility. The significance of that entails that they were able to be paid a hourly wage while they participated in a higher education program vs. doing it voluntarily in the evening and not being able to make a wage. In discussing this opportunity with the students, they were thrilled at the prospect to be able to focus on themselves, while still being able to provide for their families as needed on the outside. This put the cohort in a unique position to really focus on what they could do, and participate in, to build a successful future for themselves.

The engineering class really started this program off on a sprint. It was very hands on and the individuals in the course thrived on that. I received many messages, and had frequent hallway discussions, with the individuals about this course. Many never knew what engineering consisted of until this course. One student even disclosed that she has been calling home to her children to tell them what they do in class each week and now their child wants to become an engineer. Not only do these courses impact the individuals taking them, but they also have a ripple effect on their people within that individual's radius. This course made math fun again! This course had such a successful impact on the individuals in the course, that they have asked for additional engineering courses to be considered as part of their degree program.

It will be very interesting to see if some of the individuals pursue a more engineering focused program upon successful completion of their associate degree.

4. Insight Gained from the Expedition

The insights taken together are more powerful than any one insight. Although the expedition affected each of the authors differently some common themes emerged. Themes included the accessibility of the technical material, the importance of communication, and the value of emotional safety. Some interesting differences included motivation for embarking on the journey, specific takeaways, and how the experience changes the individual's trajectory. Another insight is that each participant on the expedition felt some stress and also grew and developed--- and affected other participants on the journey.

A limitation to the study is that the findings reflect a specific organization, instructor and other participants, at one point in time. Further, the time is unique (i.e., the second year of the COVID pandemic). Therefore, the study findings are not generalizable to other situations. Additional research to explore effective STEM education in a correctional setting as well as the effect of such education is needed.

5. Conclusion

Like all journeys, this expedition left a mark on those who traveled it. Each author brought a unique perspective that shone a beam of light on the traveled path. Because each beam originates from a different location and focuses on a different part of the path a better picture of the journey emerged. Illuminating the path of a project-based engineering course in an incarcerated setting could inspire new avenues for engineering education, foster thought about engineering education in traditional spaces, and show the impact of correctional education. Additional research is clearly warranted. One promising area of research is to reframe the instructor's role from being *the expert* to being *a contributor*. Another area of research is to explore the boundaries of teaching project-based engineering to prisoners in ways that assure growth of the incarcerated student while avoiding issues with the misuse of engineering education.

References

- [1] R. S. Frase, "Punishment Purposes," *Stanford Law Review*, vol. 58, no. 1, pp 67-83, Oct 2005.
- [2] A. E. Carson, "Prisoners in 2019," U.S. Department of Justice, Washington D. C., USA, Bulletin NCJ 255115, Oct 2020
- [3] U. S. Department of Education, "Correctional Education: Adult Education and Literacy," Office of Career, Technical, and Adult Education.
<https://www2.ed.gov/about/offices/list/ovae/pi/AdultEd/correctional-education.html> (accessed Jan 31, 2022)
- [4] M. Frolander-Ulf and M. Yates, "Teaching in Prison," *Monthly Review*, vol. 53, no. 3, July 2001, pp. 114.
- [5] R. Utheim, "The Case for Higher Education in Prison: Working Notes on Pedagogy, Purpose, and Preserving Democracy," *Social Justice*, vol. 43, no. 3, Sep. 2017, pp 91.
- [6] S. Dewey *et al.* "Higher Education in Prison," *J. of Correctional Education*, vol. 71, no. 1, Apr. 2020.
- [7] J. Holloway, P. Moke, "Post Secondary Correctional Education: An Evaluation of Parolee Performance," Lebanon Correctional Institution, Lebanon, OH, USA, Rep. ED 269 578, May 1986.
- [8] M. G. T. Denney and R. Tynes, "The Effects of College in Prison and Policy Implications," *Justice Quarterly*, vol. 31, no. 7, Dec 2021.
- [9] S. Lockwood *et al.*, "The Effect of Correctional Education on Postrelease Employment and Recidivism: A 5-Year Follow-Up Study in the State of Indiana," *Crime & delinquency*, vol. 58, no. 3, Apr. 2012, doi: 10.1177/0011128712441695.
- [10] R. H. Kim and D. Clark, "The Effect of Prison-based College Education Programs on Recidivism: Propensity Score Matching Approach," *J. Criminal Justice*, vol. 41, no. 3, May 2013, doi: 10.1016/j.jcrimjus.2013.03.001.
- [11] L. Winterfield *et al.*, "The Effects of Postsecondary Correctional Education," Urban Institute Justice Policy Center, Washington D. C., USA, 2009.
- [12] L. M. Davis, "Higher Education Programs in Prison: What We Know Now and What We Should Focus on Going Forward," RAND Corporation, Santa Monica, CA, Perspective PE-342, 2019.
- [13] M. Fine *et al.*, "Changing Minds," in *Interrupted Life: Experiences of Incarcerated Women*, R. Solinger *et al.* Eds., Berkley, CA, USA: University of California Press, 2010, pp 188-195.

- [14] C. A. Chappell, "Post-Secondary Correctional Education and Recidivism: A Meta-Analysis of Research Conducted 1990-1999," Ed.D. Dissertation, Dept. of Ed. Foundations, Univ. of Cincinnati, OH, USA, 2003.
- [15] M. Ellison, *et al.*, "A Rapid Evidence Assessment of the Effectiveness of Prison Education in Reducing Recidivism and Increasing Employment," *Probation Journal*, vol. 62, no. 2, Mar. 17
doi: 10.1177/0264550517699290
- [16] C. A. Chappell, "Post-Secondary Correctional Education and Recidivism: A Meta-Analysis of Research Conducted 1990-1999," *J. of Correctional Education*, vol. 55, no. 2, June 2004, pp 108.
- [17] L. M. Davis *et al.*, "Evaluating the Effectiveness of Correctional Education: A Meta-Analysis of Programs That Provide Education to Incarcerated Adults," RAND Corporation, Santa Monica, CA, 2013.
- [18] H. D. Jenkins, S. J. Steurer, and J. Pendry, "A post release follow-up of Correctional Education Program Completers Released in 1990-1991," *J. of Correctional Education*, vol. 46, no. 1, Mar. 1995, pp 20.
- [19] R. Bozick *et al.*, "Does Providing Inmates with Education Improve Postrelease Outcomes? A Meta-analysis of Correctional Education Programs in the United States," *J. Exp Criminol*, vol. 14, pg. 389, doi: 10.1007/s11292-018-9334-6.
- [20] A. Weaver, D. Rousseau, A.J. G. Napior, "Learning From Teachers: A Needs Assessment of Faculty in Postsecondary Correctional Education," *J. of Correctional Education*, vol. 71, no. 1, Apr. 2020, pp 18, doi: 10.2307/26915041.
- [21] S. Moore and T. Erzen, "The Relationship Between Liberal Arts Classroom Experiences and the Development of Agency-related Well-being for Incarcerated Students," *J. of Higher Education in Prison*, vol. 1, no. 1, 2021, pp 30.
- [22] K. J. Scott, "Corrections and Education: The Relationship between Education and Recidivism," *J. of Intercultural Disciplines*, vol. 15, Apr. 2016, pp 147.
- [23] C. A. Curtis, D. Evans, and E. Pelletier, "Developing Social Capital through Post-Secondary Correctional Education," *J. of Offender Rehabilitation*, vol. 60, no. 4, Apr. 2021, pp 270, doi: 10.1080/10509674.2021.1909200.
- [24] R. Wright and T. Gehrig, "From Spheres of Civility to Critical Public Spheres: Democracy and Citizenship in the Big House (Part I)," *J. of Correctional Education*, vol. 59, no. 3, Sep. 2008, pp 244.

- [25] R. Wright and T. Gehrig, "From Spheres of Civility to Critical Public Spheres: Democracy and Citizenship in the Big House (Part II)," *J. of Correctional Education*, vol. 59, no. 4, Dec. 2008, pp 322.
- [26] D. Evans, "The Elevating Connection of Higher Education in Prison: An Incarcerated Student's Perspective," *Critical Education*, vol. 9, no. 11, Aug. 2018, pp 1.
- [27] G. Gardner, "The Relationship of Higher Education Programs on Recidivism Delivered Through a North Carolina Community College in a Correctional Setting," Ph.D. dissertation, Dept. of Adult and Community College Education, North Carolina State University, NC, USA, 2004.
- [28] R. Earl, "The Relationship Between Inmate Education and Disciplinary Infractions in Prison," M.S. thesis, Criminal Justice, St. Cloud State University, St. Cloud, MN, USA, 2017.
- [29] J. Gerber and E. Fritsch, "Prison Education and Offender Behavior: A Review of the Scientific Literature," Sam Houston State University, Huntsville, TX, USA, ED 369 677, 1993.
- [30] T. M. Osberg and S. E. Fraley, "Faculty Perceptions of Teaching in a Prison College Program: Motivations, Barriers, Suggestions for Improvement, and Perceived Equivalence to Traditional College," *J. of Correctional Education*, vol. 44, no. 1, Mar. 1993, pp. 20.
- [31] K. Richard, "College Programs in Women's Prisons: Faculty Perceptions of Teaching Higher Education Behind Bars," Ph.D. dissertation, The Graduate School of Education and Human Development, The George Washington University, Washington, D. C., USA, 2017.
- [32] A. Raymond, "Teaching College-Level Mathematics in Prisons," *Notices of the North American Mathematical Society*, vol. 66, no. 11, Dec. 2019, pp 1821, doi: 10.1090/noti1984.
- [33] A. Bazos and J. Hausman, "Correctional Education as a Crime Control Program," UCLA School of Public Policy and Social Research, Los Angeles, CA, USA, 2004.
- [34] L. M. Davis, *et al.*, "Serving Time or Wasting Time? Correctional Education Programs Improve Job Prospects, Reduce Recidivism, and Save Taxpayer Dollars," RAND Corporation, Santa Monica, CA, Infographic IG-113-BJA, 2013, doi: 10.7249/IG113.
- [35] J. Ellis, C. McFadden, and S. Colaric, "Factors Influencing the Design, Establishment, Administration, and Governance of Correctional Education for Females," *J. of Correctional Education*, vol. 59, no. 3, Sep. 2008, pp 198.
- [36] E. Novek, "Making Meaning: Reflections on the Act of Teaching in Prison," *Rev. of Communication*, vol. 19, no. 1, Feb. 2019, doi: 10.1080/15358593.2018.1554824.

- [37] J. Maher, "Teaching Academic Writing in a Maximum Security Women's Prison," *New Directions for Community Colleges*, vol. 2015, no. 170, June 2015, pp 79, doi: 10.1002/cc.20146.
- [38] C. Borden, P. Richardson, and S. J. Meyer, "Establishing Successful Postsecondary Academic Programs: A Practical Guide," *J. of Correctional Education*, vol. 63, no. 2, Sep. 2012, pp 6, doi: 10.2307/26507628.
- [39] C. A. Winters and M. Mathew, "Education Policy for Large Jail Programs: A Case Study," *J. of Correctional Education*, vol. 44, no. 3, Sep. 1993, pp 124.
- [40] T. Gehring, "Five Principles of Correctional Education," *J. of Correctional Education*, vol. 39, no. 4, Dec. 1998, pp 164.
- [41] E. Novek, "Making Meaning: Reflection on the Act of Teaching in Prison," *Review of Communication*, vol. 19, no. 1, Feb. 2019, pp 55, doi: 10.1080/15358593.2018.1554824.
- [42] S. Dewey *et al.*, "Higher Education in Prison," *J. of Correctional Education*, vol. 71, no. 1, Apr. 2020, pp 57, doi: 10.2307/26915042.
- [43] R. Armstrong and A. Ludlow, "Educational Partnerships between Universities and Prisons: How Learning Together can be Individually, Socially, and Institutionally Transformative," *Prison Service J.*, no. 225, May 2016, pp 9.
- [44] S. J. Meyer *et al.*, "Implementing Postsecondary Academic Programs in State Prisons: Challenges and Opportunities," *J. of Correctional Education*, vol. 61, no. 2, June 2010, pp 148.
- [45] D. F. Russ-Eft, H. S. Preskill, R. T. Torres, "Focusing the Evaluation," in *Evaluation in Organizations: A Systematic Approach to Enhancing Learning, Performance, and Change*, 2nd ed., New York, NY, USA: Basic Books, ch. 5, pp 179-220.
- [46] R. K. Yin, "Getting Started: How to Know Whether and When to Use the Case Study as a Research Method," in *Case Study Research: Design and Methods*, 5th ed., Los Angeles, CA, USA: Sage Publications, ch. 1, pp 1-69.
- [47] R. K. Yin, "Designing Case Studies: Identifying Your Case(s) and Establishing the Logic of Your Case Study," in *Case Study Research: Design and Methods*, 5th ed., Los Angeles, CA, USA: Sage Publications, ch. 2, pp 27-70.
- [48] "Minnesota Correctional Facility – Shakopee Inmate Profile," Minnesota Department of Corrections, St. Paul, MN, USA, 21 Jan. 2022. [Online] Available: <http://https://coms.doc.state.mn.us/tourreport/04FacilityInmateProfile.pdf>.
- [49] K. Patterson *et al.*, *Crucial Conversations: Tools for Talking When the Stakes Are High*, 2nd ed., New York, NY, USA: McGraw-Hill, 2012.

[50] D. Norman, *The Design of Everyday Things*, Revised and Expanded ed., New York, NY, USA: Basic Books, 2013.

[51] B. Orlin, *Math with Bad Drawings*, New York, NY, USA: Black Dog & Leventhal Publishers, 2018.

[52] K. Bender, "Education Opportunities in Prison Are Key to Reducing Crime," The Center for American Progress, Washington, D. C., USA, 2018.