From Ivory Towers to Prison Towers:

How to establish informal science education programs for the incarcerated

INSPIRE: Initiative to bring Science Programs to the Incarcerated
University of Utah, School of Biological Sciences
nalini.nadkarni@utah.edu
257 South 1400 East, Salt Lake City UT 84112
Chapter 1
Why bring science education to the incarcerated?

He who opens a school door, closes a prison.
---- Victor Hugo

One of the most underserved populations in terms of science education and connection to scientists in the USA are incarcerated adults. Over 2.1 million American adult men and women, and over nearly 50,000 youth) are incarcerated in prisons, jails, and juvenile detention centers (Carson, 2015; Office of Juvenile Justice and Delinquency Prevention 2017; Bureau of Justice Statistics 2018). Ethnic minorities (African-Americans, Latinos, and Native Americans) make up a disproportionate amount of this population: ca. 57% of prisoners are African-American or Latino, although they make up only 29% of the total population in the USA (Carson, 2015). Most have poor educational backgrounds, and, while incarcerated, have little or no access to traditional science education institutions nor to remote educational opportunities.

Increasingly however, the incarcerated are being included in efforts to enhance the scientific capacity of underserved populations and society as a whole. Studies conducted over the last two decades almost unanimously indicate that higher education programming in prisons reduces recidivism, increases the probability of post-release employment, translates into reductions in crime, taxpayer savings, and provides greater safety in communities to which formerly incarcerated people return. A recent meta-analysis that examined formal education (adult basic education, high school/GED, postsecondary education, and vocational training programs) indicated strong positive outcomes (Davis et al. 2013).

The number of formal higher education programs in prisons is growing (Karpowitz, 2005, Davis et al., 2013), but resources for education programs offered by corrections institutions are limited; only 6% of corrections spending is being used to pay for all prison programming, including educational programs. Most such programs focus their limited resources on basic and secondary adult education, life skills, and vocational training aimed at post-release employment and functional social behavior (Harlow, 2003; Chappell 2004; MacKenzie, 2006). Formal science education programs can be time-consuming to initiate, maintain, and evaluate, especially in states where legislators do not wish to appear "soft on crime" by expending state funds for education for those who have broken laws. Because most current and potential incarcerated students have little financial
capacity to pay for tuition, they nearly always require substantial financial support from a foundation or academic institution, as well as collaborative commitments from corrections institutions. In many corrections institutions (particularly county and city jails), sentences are too short to allow a commitment to a formal program that may extend for weeks or months. Inmates are often transferred without warning to different cellblocks, breaking the continuity of instruction.

An often overlooked and underutilized approach is the use of science learning lectures and workshops to bring STEM education into correctional institutions. Although this type of program does not align with a particular curriculum nor provide formal academic credit, it can nonetheless allow inmates to gain inspiration and knowledge that may promote a successful return to their communities (Porporino & Robinson 1992, Deguilds 1995, Vacca 2004). This type of program uses an informal science education (ISE) approach, i.e., lifelong STEM learning that takes place across a multitude of designed settings and experiences outside of classrooms and other formal settings, and typically do not result in credit or professional certification. The objectives of ISE include fostering changes in knowledge and understanding through lifelong learning; growing skills that develop capabilities, values, and ways of thinking; and understanding and appreciating critical thinking and scientific processes, all of which constitute preferred outcomes of out-of-school and informal contexts (McCallie et al. 2009). Relatively few correctional educational programs have been structured within the ISE framework because their outcomes and ways of implementation are poorly documented. However, in the last decade, a handful of academic institutions have implemented ISE programs that bridge the gaps between science and the incarcerated (Nadkarni and Morris 2018, LeRoy 2015, Gallegher 2013).

Because a growing number of scientists and science administrators perceive the values of broadening the impacts of their research to underserved public groups (Varner 2014; Funk 2015), there is an expanding cadre of scientists who are interested in participating in ISE with underserved public groups, including the incarcerated. Thus, lectures can be delivered in an ISE format by academic and agency scientists who, with minimal investment of their own time, can describe the excitement, rationale, and applications of their research and/or describe their scientific discipline directly to people who are incarcerated.

Recent studies have suggested that ISE programs for the incarcerated have the capacity to significantly improve inmates’ science content knowledge, their perception of science and scientists, and their interest in learning about science (Nadkarni and Morris, 2018). Further research suggests that such programs also have a profound impact on the academics helping to run them, with participants reporting strongly positive experiences, more favorable views of the incarcerated, and a greater interest in social justice issues (Nadkarni and Horns in prep). Combined with the reductions in recidivism and improved employment prospects offered by education, these results provide strong incentive for developing new ISE programs for the incarcerated.
Chapter 2
Selecting and contacting an institution

There is, on average, a correctional institution within 20 miles from all academic institutions. This means there is potential to enact a STEM program regardless of wherever a scientist is based.

Over 2 million people are in custody in the United States, spread across nearly 7,000 correctional institutions (CI). The best records for facilities are kept by each state’s Department of Corrections. You can locate a state prison or county jail with a simple Google search, as nearly all correctional institutions maintain a website.

**Uniqueness of each institution**

The operations, policies, and attitudes about education at every CI are highly dependent on the staff and management as well as the type of institution. Prisons, where inmates are held for more extended periods, often have more programs for the incarcerated than jails, where inmates may only be held a short time. Even within an institution type some administrators are very welcoming to education programs for inmates while others may see them as unnecessary or irrelevant to the CI’s mission. If one institution is unreceptive, contact staff at another facility. CIs have different security levels and existing educational and volunteer programs. Minimum security or transitional programs (where inmates prepare to reenter society) may be more receptive to establishing a STEM education program.

Similarly, institutions vary in terms of the types of programs they can functionally undertake. Simple programs, like lectures, may be realistic in more institutions than more involved programs that entail hands-on participation (Picture 2.1).

**Making contact**

*Picture 2.1: All correctional institutions are unique in terms of their receptiveness and what they can offer. The Salt Lake County jail constructed an experimental pond allowing researchers to work with inmates to conduct bird surveys.*
Although getting a foot in the door can be one of the most challenging aspects of developing an educational program, there is generally a network of people and groups, both inside institutions and out, that can help you get established.

Visit the CI’s website for contact information. Some institutions will not have their own website, in which case you can find contact information on the website of the state department of corrections. Although CIs may list only a single phone number and email address for general correspondence, many provide a list of administrators, allowing you to target your communication more effectively. Titles such as “Volunteer Coordinator”, “Institutional Programming”, and “Special Projects” denote people with roles that deal with educational programs. The job responsibilities for the majority of corrections staff leave limited time to establish new or “outside” programs, however. Responses may be slow, and it may be necessary to make several attempts before receiving any return communication.

Your relationship with corrections staff is critical to your program’s success. Make sure to be open and friendly with all staff members with whom you interact. Make time for casual conversations that do not directly pertain to your program. Be prepared for high rates of staff turnover that necessitate forging new relationships (see Chapter 8). In addition, make sure to be respectful of titles that corrections staff prefer to use or avoid. There are well-established rank structures within CIs (i.e. warden above captain above lieutenant above sergeant above deputy/officer) and staff will appreciate being addressed by the title they have worked hard to earn. Similarly, certain terms for corrections staff that are common in everyday conversation, like guard, are often frowned upon by those in the criminal justice system.

The majority of CIs will also have already-established volunteer programs that you can contact for help setting up your own. Although science education is fairly rare, many CIs have volunteers from other organizations, such as substance abuse programs or religious organizations, that have long-running activities and relationships. People in these groups can provide valuable advice on points of contact and the unique challenges of an institution. A list of volunteer organizations may be available on the website of the CI.

Consider reaching out to CIs that already have science education programs to help establish yours. An institution may be more receptive to establishing a new program if the initial contact comes from staff at another CI. A volunteer coordinator that oversees an ongoing science education program can help find the correct point of contact at your institution and may also be willing to reach out for an introduction via telephone or email.
Chapter 3
Framing the program for different audiences

Finding a positive reception for your program depends upon how it is framed to different audiences. Highlight the positive impacts as they pertain to the specific values of each audience.

**Corrections staff**
Correctional staff are primarily concerned with public safety, the safety and security of within their institution, reducing the rate of recidivism, and increasing post-release employment.

When speaking with staff at a CI, emphasize how ISE can reduce the chances of a released inmate re-offending. Provide in written form an abstract of studies such as Rand (2013), a meta-analysis that has shown that receiving any kind of education while incarcerated reduces the chances of recidivism by 13% and increases the chance of post-release employment (Davis et al. 2013). Point out that these programs may help alleviate overcrowding and reduce the pressure on correctional budgets. This type of argument can be especially effective when speaking with institutional administrators, since their performance is often based on recidivism rates.

**Academics**
Academics are primarily concerned with research output and funding. In consequence, investing large amounts of time in a science program for the incarcerated may be viewed as a poor use of academic time and resources by scientists who believe the time of researchers is better spent in the lab or writing papers. However, grants from many research funding institutions (e.g., National Science Foundation, National Aeronautics and Space Agency) increasingly require that scientists carry out activities related to “broader impacts” of their research, to academic merit. A STEM program for inmates is an excellent broader impact to include on grant applications, as it focuses on a drastically underserved population. Participation in a program that focuses on these diverse audiences can provide a powerful diversity statement for grant proposals, particularly for early-career academics.
Chapter 4
Types of programs

Informal science education programs for the incarcerated can take many forms. A lecture series may be the simplest to establish. However, if time and resources permit, you may consider creating a program with more hands-on engagement.

Lectures
The simplest format of science program to establish is a regular lecture series with talks given by volunteer scientists. A prison population can be a difficult group to present to because the education and background will almost always be different from one person to another. Therefore, it is critical to design a talk that is understandable to people who may not have attended high school while at the same time keeping the attention of those with college degrees. Some considerations for scientists to prepare for a presentation are:

- This is not an academic seminar. Try not to construct a standard background-question-result style talk as you would for a scientific conference. Focus on instilling interest and excitement about your general field of science, with one or two large take-home messages about your own field of research. It’s often more effective to focus on your area of study generally and discuss your research in a broad sense, highlighting some principal findings rather than detailing methods. A good guideline to remember is to instruct presenters to design presentations for “understanding at the possible expense of content.”

Story-telling.
Audience members will be more attentive to a talk that includes a narrative. You may consider weaving in a personal story or historical event that ties in with your topic.

Keep it simple.
Avoid jargon. Occasionally, there will be a word or phrase that a you feel is important for the audience to know. If so, make sure to define the word when you first introduce it, and then re-explain it briefly later on. Be aware that many academics will have to work hard to avoid using jargon. Be sure to inform presenters of this as well as the potential pitfalls of the “expert blind spot” (making assumptions about an audience’s prior understanding that may be highly inaccurate). It can be very helpful to rehearse your talk with someone outside of the field, asking them to point out jargon that you might not otherwise pick up on.

Reduce text on slide as much as possible. Reading speed will likely vary widely among the audience and many attendees may miss what is being discussed while trying to absorb what is written on slides.
Keep all figures as simple as possible. Remove error bars, outliers, references to statistical analyses, or anything that is not critical to understand what the graph represents. Axes can also be simplified from numerical to an arrow with simple text such as, “increasing weight.”

Be flexible.
Often, incarcerated participants will ask questions that are that veers away from your central thesis, as this is an excellent opportunity to speak on a topic that audience members are already interested in, but don’t hesitate to defer a question or comment that is completely off-topic to the question and answer period, or by suggesting a one-on-one exchange after the presentation.

A 30-minute talk with 15 minutes after for question-and-answer period is a way to convey a few core take-home messages in an understandable and exciting way. Allowing the topic of lectures to vary from lecture to lecture provides a greater diversity of subject matters that may help attract more attendants. Even if you wish to eventually create a more ambitious program, beginning with a lecture series is a good way to initiate a program and develop an understanding of the institutional system.

Conservation projects
Participating in a conservation project, such raising an endangered local species, may help inmates feel a more personal connection with the natural world, promotes a sense of “giving back” to society, and provides skills that are translatable to the STEM workforce, while also providing real conservation benefits. These programs tend to require more time, from both academics and corrections staff, and therefore are more challenging to implement. However, inmates that participate in a conservation program can learn new skills (e.g., horticulture, data recording) in addition to engaging with science content in an intimate and meaningful way. This can greatly improve their self-perception as science learners and their ability to visualize themselves working in STEM. To help facilitate a conservation program:

Partner with local conservation groups.
Look into local conservation groups to learn about their ongoing projects. It is much easier to expand an on-going project to a CI
rather than create a new project. Many conservation groups have projects such as growing native plants or creating nesting boxes that can be easily transferred to a correctional environment.

Create simple protocols. 
Depending on the CI, inmate turnover can be high and new people are must learn protocols. Corrections staff may not have the time to continually train new inmates, so the protocol needs to be simple and easy to learn, and documented in ways that the participants can understand.

Provide lectures on topic. 
Giving lectures that convey the why of a conservation project can help inmates understand the reasons they are participating and how their efforts fit into a larger picture.

Provide updates. 
Let corrections staff and inmates know how effective the conservation programs are.

For an example of a conservation project undertaken by INSPIRE, see box 4.1
Chapter 5
Evaluation and IRBs

Gauging the effectiveness of a STEM education program can help improve how the program runs, increasing its ability to make a positive impact. Additionally, evaluation outcomes that show that a program is shifting inmates’ perception of science, and of themselves as science-leaners, can be a powerful tool to justify the program to corrections staff and academic administrators, as well as securing funding.

One of the key benefits of an ISE program for the incarcerated is the ability to document learning outcomes and demonstrate how inmates shift their views of science and themselves as science learners. An effective way to measure these changes is by distributing pre/post surveys that attendees fill out before and after seeing a lecture or participating in a conservation program (Picture 5.1). Using Likert-type scale questions (i.e. how much do you agree with…? How likely are you to…?) combined with a few short answer questions is a good balance between having a survey that is quick and easy to complete and collecting usable information. Types of questions that can provide valuable insight include:

Science content knowledge.
Including a few questions specific to the lecture or project that inmates will be participating in gauges prior knowledge on a subject and how effective a program is at improving that knowledge base. True/false questions will allow answers to be placed on a Likert-scale (for example by asking how much respondents agree with a statement that is scientifically accurate or not) improving the efficiency with which surveys can be completed.

Perception of science/scientists.
Questions that address general attitudes towards science, like “Does science help in your daily life?” can evaluate whether your program is effectively improving the perception of people who may never have been formally exposed to science.

Perception of self as a science-learner.
A principal reason to work with an underserved audience is to help break down some of the false assumptions they may have about their own ability to understand science. Asking respondents how much they agree (or not) with statements such as, “Science is too hard for me” and, “I would enjoy studying science” can identify important changes in how receptive a participant may be to STEM education in the future.

Interest in science.
A commonly held perception of the incarcerated is that they have little desire to seek out science information on their own time. In fact, earlier studies suggest a
significantly high pre-existing degree of interest in science among prison populations, indicating a population hungry for more STEM education (Kaye et al. 2015; LeRoy 2015; Nadkarni and Morris 2018). Questions that ask how likely an inmate is to discuss the day’s topic with cellmates and family or seek out information from books and newspapers can justify informal STEM programs and help change how people outside the justice system view the incarcerated.

Surveying the lecturers participating in the program as well can highlight valuable reciprocal effects of how involvement shifts academics’ views on the importance of community engagement and the incarcerated. Recent analysis by INSPIRE suggests that academics that have participated in the program report an overwhelmingly positive experience. In addition, lecturers report that their own views of the incarcerated were significantly improved by the experience and that participating motivated them to take a greater interest in social justice issues.

One important consideration in developing surveys is that the rules regarding what materials are permissible in a CI, and what kinds of information are permissible to gather, will vary considerably between institutions. Identifying information, such as names or prisoner IDs, may be allowed to be gathered in one institution but not in another. Likewise materials, like staples and paper clips, may be excluded.

**Internal Review Boards**

If you plan to publish data collected from surveys, you must gain approval from the Internal Review Board (IRB) at your institution. The IRB process is extremely time consuming and therefore may be better left until the program is more established.

IRBs are required whenever a study is collecting data from human participants and are intended to protect the privacy, safety, and basic rights of subjects. The incarcerated are a particularly challenging group to survey because they are one of three “highly sensitive” or “vulnerable” groups that require greater oversight for IRB approval. Getting IRB approval can take hundreds of hours of protocol creating and amendment. The process can be tedious and time-consuming and may be difficult to complete at the same time as creating a STEM education program. It may be best to wait until the program is up and running before beginning the IRB process. An alternative option is to partner with a program that already has active IRB approval.

Even without an IRB, surveys can be distributed to inmates and the information used to improve a program or justify its importance to CI or academic staff, so-called “program evaluation”. However, the results cannot be published without IRB approval.
Chapter 6
Potential criticisms

Any project that deals with the incarcerated is likely to attract controversy. Several common complaints are often levied against corrections education or work programs (not just STEM programs).

Bolstering a broken system
Many proponents of criminal justice reform campaign to significantly overhaul, or even eliminate, the current corrections system in the United States. They view educational programs for the incarcerated as a tool that can be used by people within the criminal justice system to defend the current structure as trying to help offenders. Although the system sustains many flaws, biases, and injustices, a large institutional change in the near future is unlikely. Therefore, a program that can in some way improve the experience, and more importantly the post-release prospects, of the incarcerated can be of value. In addition, many lecturers report coming away with a greater desire to learn about or act on criminal justice, suggesting that such a program may even accelerate reform.

Exploitation of labor
Conservation programs that require outdoor physical labor but offer little to no compensation are sometimes accused of exploiting cheap labor from a captive audience. Most CIs offer work programs where inmates conduct physical labor but regulations severely limit their earnings. Enacting a conservation project often falls within these programs. Because the work can be strenuous and the compensation meager, many people condemn these programs as exploitive. Although the wages earned by inmates are modest, the opportunity to participate in a conservation program provides valuable mental stimulation and at least some degree of wage-earnings. Additionally, these projects can provide inmates with new skills that may increase the changes of post-release employment.

Removes time for research
People within academia may not support a program if they feel it draws too much time away from research. Enacting and sustaining a STEM program for the incarcerated requires substantial amounts of time, potentially limiting research output. However, such programs significantly enhance the chances of grant funding.
Chapter 7
Dissemination

Spreading the results of your work is helpful in garnering support and funding. Academic papers and popular media are both great ways for spreading news about your work with the incarcerated but vary in the populations they are likely to reach.

Peer-review
Publication of survey results can be a good way to document effects of an ISE program, but requires substantial amounts of institutional coordination and approval. If you have the capacity to work through the IRB process, or can participate under an already established program, a peer-reviewed publication is great not only for disseminating your findings, but also for justifying the program to academics, funding sources, and policy-makers. Publishing in a journal specific to your field can help encourage colleagues to participate or enact similar programs, while publishing in a criminology journal can help reach people more directly involved with corrections operations.

Media
Media outlets are not able to provide the same level of detail or objectivity as a peer-reviewed manuscript. However, they can reach a much larger audience in a short amount of time and may be useful for generating public support for a program. Corrections staff, who are used to seeing their work and institutions portrayed negatively in the media, are likely to be excited to see a positive light shined on current programs.
Chapter 8
Funding and project sustainability

ISE programs are most effective if they can be sustained over many years. Continuity depends on financial support and, more importantly, support from the corrections facility and a researcher’s academic institution.

Funding

Though some financial support is required, at the simplest level a STEM program for the incarcerated can be conducted using almost no funds. By keeping a program simple and relying on volunteer researchers, the budget required to run a program can be very small. Often the only regular cost is transportation to and from the CI. Depending on long-term goals, such as enacting conservation projects or expanding to multiple institutions, more funding may be required. Funding may be easier to secure by starting small and gathering preliminary data on the efficacy of a program. After the program has been established and produced encouraging results, grant organizations and private donors may be more willing to sustain the project.

Academic institution support

Include a board of faculty members and other long-term academics to ensure that a project doesn’t come to a stop due to turnover. Often STEM programs for the incarcerated are established by a single student or faculty member at an institution. When the student graduates, or faculty member retires or changes institutions, a program can cease to function. Consider creating an advisory board for the program comprised at least partly of tenured faculty.

Correctional institution support

A good relationship with staff at a CI is critical for the long-term continuity of any program. Develop friendly rapport with corrections staff and make time to forge new relationships when staff change positions. Turnover at many CIs tends to be fairly high so be prepared to continually interact with new people. Make sure to include corrections staff at all levels of a program. Share updates on any results or publications that come from surveys and extend invitations to dinners, parties, or other events held to support or celebrate the program (Picture 8.1). An important general note for working with corrections staff is that they adhere to strict security and time guidelines, which may be different than what is encountered in academic settings. It is vital to adapt to the communication and logistical style of the corrections institution.

Political support

Support from local government can greatly increase the long-term funding and institutional support for a program. Regulation and directions for funding correctional institutions ultimately comes from local and state policy-makers. Reach
out to state legislators to explain the importance of a STEM program for the incarcerated. Their support can not only increase potential funding opportunities, but because corrections programming falls under their jurisdiction, they also have the capacity to bolster and sustain a program.
References

Justice.


effectiveness of correctional education: A meta-analysis of programs that provide
education to incarcerated adults*. Santa Monica, CA: Rand Corporation.

prison education programs. *Journal of correctional education, 47*(2), 74-85. Retrieved


Gallagher, B. E. (2013). *Science and Sustainability Programs in Prisons Assessing the Effects of
Participation on Inmates* (Master’s Thesis, Evergreen State College).


Punishment: Perspectives from the Humanities* (pp. 305-331). Bingley, UK: Emerald
Group Publishing Limited.

case for engaging incarcerated populations in conservation and science. *Natural areas
journal, 35*(1), 90-98. doi: 10.3375/043.035.0113


offenders and delinquents*. Cambridge, UK: Cambridge University Press.

McCallie, E., Bell, L., Lohwater, T., Falk, J. H., Lehr, J. L., Lewenstein, B. V., ... & Wiehe, B.
(2009). Many experts, many audiences: Public engagement with science and informal
science education. *A CAISE Inquiry Group Report, 1*. 


