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Prison-based Education: Programs, Participation and Proficiency in Literacy/Numeracy

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Executive Summary

Today, more people are incarcerated in the United States than in past decades, and we have the infamous distinction of being the nation that leads in incarceration rates (670 per 100,000 persons as per Walmsley 2018). Although an increasing body of research shows that correctional education works in terms of enhancing post-release employability and reducing recidivism, there is a paucity of literature that identifies the educational programs that benefit inmates the most vis-à-vis developing the literacy/numeracy skills needed for reentry into an ever-changing labor market. Identifying the type, amount and intensity of programs that reduce recidivism is not a choice, it is a critical path to reducing recidivism.

Given this need our study focuses on 3Ps – prison-based education programs, prisoners' participation in academic/vocational programs, and their proficiency in literacy and numeracy as assessed during their incarceration by the Program for the International Assessment of Adult Competencies (PIAAC) Survey of Incarcerated Adults in 2014.

Our investigation spans the following broadly defined questions –

- 1) How do inmates differ from the household population in the use of literacy/numeracy skills in life and at work?
- 2) How do participants in different types of prison-based educational programs (such as basic skills, General Equivalency Degree (GED), employment readiness and job training) reflect literacy and numeracy proficiency? That is, does proficiency vary by program?
- 3) Do inmates who participate in prison-based academic and/or vocational programs use more literacy and numeracy skills in their prison life, compared with non-participants?

Our study identified three types of prison-based programs that serve inmates who possess a range of literacy and numeracy levels – (i) programs targeting basic skills serve inmates without a GED or high school diplomas; (ii) programs that help inmates obtain a GED or high school diplomas that equip inmates with necessary proficiency in literacy and numeracy to pursue appropriate job training programs/postsecondary education, and; (iii) vocational/professional training programs that advance skills in areas such as computers, mechanics and technology.

What we found –

- Compared with the household population, a large proportion of inmates rarely use certain literacy /numeracy skills (e.g., reading bills, invoices and financial statements, reading diagrams, maps and schematics, filling in forms and writing reports at prison jobs) in life or work during incarceration, particularly when it comes to numeracy.
- Inmates who did not reach high school level and did not participate in any programs had the lowest literacy and numeracy. By contrast, inmates who participated in basic skills programs performed significantly higher than this reference group in both literacy and numeracy.
- Over two-thirds of inmates who participated in vocational programs (i.e. employment readiness and/or job training) had a high school diploma, and participants in vocational programs during incarceration were likely to use more literacy and numeracy skills in their prison life than the non-participants.

We recommend that policy makers consider the valuable link we found between skills-use and participation in vocational programs or career and technical education (CTE). From the perspective of need-based education, expanding programs targeting basic skills is a must, as

almost one in three inmates have education levels lower than high school diploma. Since evidence shows that educational programs in prison benefit inmates on improving skills, CTE should receive more resources precisely because these programs lead not only to obtaining but also retaining employment, which is a critical policy lever if we truly wish to reduce recidivism.

Introduction

This study focuses on 3Ps – prison-based education Programs, prisoners’ Participation in academic and vocational programs, and their Proficiency in literacy and numeracy as assessed during their incarceration by the Program for the International Assessment of Adult Competencies (PIAAC) Survey of Incarcerated Adults in 2014. In particular, we examine inmates who participated in prison-based educational programs, and the development of cognitive skills (i.e., literacy and numeracy as defined in PIAAC) needed for reentry into the changing labor market after being released (Dick, Rich, & Waters, 2016). Using the 2014 PIAAC US prison data, we address two overarching questions: First, we provide a general picture of the participants in prison-based education in terms of their proficiency level in literacy and numeracy and use of cognitive skills and their reasons to participate. Second, we investigate the relationship between programs, participation, and literacy/numeracy proficiency of participants.

According to a recent meta-analysis study sponsored by the Bureau of Justice Assistance, “38 percent of small states and 50 percent of medium-sized states reported that they had reduced the number of course offerings for vocational education /CTE [career and technical education] programs in response to budget cuts” (Davis, Bozick, Steele, Saunders, & Miles, 2013, p. xxi). This has led to an increasing number of voices expressing concern (Department of Justice Federal Bureau of Prisons, 2016; Dick, Rich, & Waters, 2016) about the decline of correctional education – defined for our study purposes as education and training programs designed to improve prisoners’ chances of obtaining a job after release and lower their recidivism rates (Davis et al., 2014). Such educational programs include academic programs, as well as career and technical education programs, or vocational training, which the U.S. Department of Justice,

Bureau of Justice Statistics, defines as “special programs designed to train participants for a job” (Harlow, 2003, p. 4).

In light of the shortage of effective tools and data sources that provide measures of the quality of the educational programs for inmates, the PIAAC US prison data are useful because they allow for an opportunity to study a national sample (i.e. inmates from state, federal, and private prisons), delve into some aspects of the arrangement, delivery, and scope of prison-based education programs, and connect these inquiries with meaningful and measurable outcomes. Assessing cognitive skills, rather than content areas in English and math, helps us understand how well-equipped inmates are to integrate in post-release life and work and participate in increasingly knowledge-based economies. “It is well established that prison inmates are, on average, less well educated and have fewer marketable job skills than the general population” (Wilson, Gallagher, & Mackenzie, 2000, p. 347). Thus, studying inmates’ skill proficiencies in literacy and numeracy is important and relevant. Relying on the PIAAC US prison data we ask the following research questions:

1. What are the characteristics of the incarcerated population, relative to the household population (in PIAAC), vis-a-vis education levels and literacy/numeracy levels? How do inmates differ from the household population in terms of use of cognitive skills in life and at work?
2. How do participants in different types of prison-based educational programs (such as basic skills, General Equivalency Degree (GED), employment readiness and job training) perform in literacy and numeracy proficiency? That is, does proficiency vary by program?
3. What are the reasons reported by inmates for participating (or not) in the academic or vocational programs?

4. How do inmates with different participation trajectories in prison-based educational programs perform in literacy and numeracy? How do inmates who take courses at different venues and spend different amounts of time taking courses perform in literacy and numeracy?

5. Do inmates who participate in prison-based academic and/or vocational programs use more literacy and numeracy skills in their prison life, compared with non-participants?

Extant Research on Prison-based Education Programs

It is estimated that by the end of 2015, over 1.5 million prisoners in the United States were under the jurisdiction of state and federal correctional authorities (Carson & Anderson, 2016). A 2014 report by the U.S. Department of Justice indicates that more than 700,000 individuals are released from state and federal prisons each year. An increasing body of empirical literature shows that effective correctional education programs can help improve employment outcomes, which may lead to decreased risk of reincarceration (Davis, Bozick, Steele, Saunders, & Miles, 2013; Pompoco, Wooldredge, Lugo, Sullivan, & Latessa, 2017; Tyler & Kling, 2004). However, the latest meta-analysis (Bozick, Steele, Davis, & Turner, 2018) found that inmates who did not receive correctional education were as likely to obtain post release employment as inmates who did receive it, although inmates who participated in correctional education programs were 28 percent less likely to recidivate than inmates who did not participate in correctional education programs. This finding puzzled us in terms of whether those programs can improve the inmates' cognitive skills, which are learnable, transferable in social contexts and work situations, and necessary for participating in the labor market (OECD, 2016).

Prison-Based Programs

The majority of prisoners incarcerated in the U.S. state or federal prisons will eventually be released, but a large portion of inmates lack basic educational and employment skills (Cho & Tyler, 2010; Harlow, 2003). To help inmates with low levels of education successfully reintegrate into society, most prison-based programs are offered, at least theoretically, with a sequence of courses that could advance inmates from very low reading and math levels to skills commensurate with GED acquisition or even postsecondary education (Ewert & Wildhagen, 2011). In general, there are two types of educational programs: one seeks to increase inmates' cognitive skills; the other, to equip inmates with some specific occupational skills (Cho & Tyler, 2010; Ewert & Wildhagen, 2011; Newton et al., 2018; Tolbert, 2012).

The programs studied in this paper are (i) academic (e.g., basic reading/writing/math skills, General Equivalency Diploma (GED), degree program, and ESL) and (ii) vocational (e.g., employment readiness/re-entry class and job training programs) prison-based educational programs.

Delivery of instructional services. Venue and dosage effects are some of the most discussed topics around course delivery of prison-based programs (Department of Justice Federal Bureau of Prisons, 2016; Davis et al., 2013; Pompoco et al., 2017). Venue refers to where inmates participate in a program, i.e., in prison or in local education institutions (such as a local high school, community college or university) that have partnerships with the correctional education system. Dosage effects refers to the amount of time, such as instructional hours and the length of a course, that inmates spend participating in a program. On account of issues related to safety and transportation of inmates to the off-site classrooms, the majority of programs have instruction primarily delivered via traditional teacher-inmate classrooms (Department of Justice

Federal Bureau of Prisons, 2016) but of late there have been more calls for modernized, secure delivery system, as well as more partnerships with educational institutions (Davis et al., 2013; Tolbert, 2012).

With respect to the length of a program, prison-based courses are designed with great versatility in instructional hours and curriculum standards (Davis et al., 2013; Tolbert, 2012). For instance, the length of the GED program depends on the needs of each prison facility; some need the program for 3–6 months, while others may need it for 12 months or longer. In addition, each facility's needs are reviewed annually (GED Testing Service, n.d.). According to law “128 CFR 544.70,” inmates in federal prisons who do not have a verified GED credential or high school diploma are required to attend an adult literacy program for a minimum of 240 instructional hours or until a GED is achieved. However, inmates often are transferred from one facility to another for security and prerelease reasons, and therefore, such interruptions make it more difficult to investigate the dosage effect on a prison-based program (Tolbert, 2012). In brief, “there is little to no empirical evidence that can help inform policymakers on ‘how much’ correctional education is necessary to produce a change in the desired outcomes” (Davis et al., 2013, p. XXV).

Participation

Different studies define incarcerated participants differently in order to examine the effectiveness of programs. For instance, in a large-scale multidimensional test of the effect of prison education programs in Texas, the researchers compared inmates who participated in academic programs, with inmates who participated in vocational programs, and with inmates who participated in both academic and vocational programs (Adam et al., 1994). The comparison

revealed that inmates in the academic programs had substantially lower educational achievement test scores than inmates in other categories.

In another large-scale study on participation in Ohio prison education programs, comparisons were conducted between inmates who completed GEDs or college classes, and inmates who enrolled in programs but did not complete them, and nonprogram inmates (Pompoco et al., 2017). Previous studies reinforced the importance of completing programs during incarceration (Duwe, 2017; Duwe & Clark, 2007; Pompoco et al., 2017). Among more than 92,000 male inmates admitted to Ohio prisons between January 2008 and June 2012, “completing vocational training and apprenticeship programs, GEDs, or college classes at any point during incarceration coincided with lower rates of prison returns within 3 years after release” (Pompoco et al., 2017, p. 515).

Another element related to participation is the number of programs in which inmates participate. Duwe and Clark (2007) examined the predictors of postrelease employment outcomes for 15,111 prisoners released from Minnesota prisons between 2007 and 2010. They found that the higher the number of correctional education programs in which inmates participated, the higher their chances to find jobs, and the quicker they were employed after release from prison. Overall, it is important for inmates to participate in and complete more programs (e.g., basic and vocational).

Completing vs. not completing academic programs. A study of male inmates released from Wisconsin prisons in the late 1980s found that those who completed basic or vocational programs were one-third less likely to recidivate than those who did not complete the program (Piehl, 1995). Based on this study, we are interested in two hypothesis tests: (a) inmates who completed a level of educational programs in prison have higher literacy and numeracy than

those who chose not to pursue any further education in prison; and (b) inmates who completed a level of educational program in prison use more literacy and numeracy skills in their everyday life in prison than those who did not. In Piehl's study (1995), various techniques were applied to control for sample selection bias. In our study, although the PIAAC data are nationally representative, we cannot make any causal-effect inference merely based on comparisons in terms of proficiency and use of cognitive skills between inmates who reported completing their highest level of education during the current period of incarceration ("Current period" refers to during the PIAAC survey) and those who reported they did not complete any further (higher) education during the incarceration.

Participation vs. non-participation in vocational programs. A recent meta-analysis suggests that vocational training programs have a greater effect than academic programs on one's odds of obtaining post release employment (Davis et al., 2013). However, there remains a lack of empirical studies that examine the link between participation in vocational programs and subsequent employment success (Newton et al., 2018). In our study, although we could not reach any conclusion between participation in vocational programs and post release employment, what we were able to do is to examine the connections between (a) participation and literacy/numeracy, and (b) participation and use of literacy/numeracy skills in life during incarceration. These two links potentially support post release employability, to wit, that higher literacy/numeracy and more use of cognitive skills lead to a higher chance in the job market. Our hypothesis is that the inmates who reported participating or having participated in vocational programs during the current period of incarceration have higher literacy/numeracy and use more cognitive skills in prison life than those who did not participate in vocational training.

Waiting list. Inmate participation in prison-based programs is influenced by some characteristics of correctional education, such as enrollment policies (for instance, first come first served, open-entry and open-exit) and access or availability issues (Department of Justice Federal Bureau of Prisons, 2016; Dick, Rich, & Waters, 2016; Tobert, 2012). Factors associated with waiting list include class size limitations and inappropriate placements. There is sparse literature for this topic and a lack of information is often cited as a reason for not investigating what qualifies an inmate to be placed on a waiting list or how waiting lists are developed and managed (Dick, Rick, & Waters, 2016).

Again, while the PIAAC data do not allow us to directly answer these questions, what we are nevertheless able to do is to separate individuals on the waiting lists who wanted to enroll in a program from individuals (on the waiting list) who did not want to enroll. By law (28 CFR 544.70), inmates who do not have GED or high school diploma are required to participate in basic literacy programs and should be given priority for enrollment into the basic academic programs if a wait list exists (DOJ, 2003). Some states, such as Maryland, have a long waiting list for correctional education programming, and “insufficient capacity may be the primary explanation for the gap between eligibility and program enrollment” (Crayton & Neusteter, 2008, p. 11).

It is unclear whether the low rate of participation in prison-based literacy programs “is caused by long waiting lists, inmates choosing not to participate, or states cutting services because of budget constraints” (Crayton & Neusteter, 2008; U.S. Department of Education, 2011, p. 3). However, there is a possibility that some individuals on the waiting list are required to participate in programs such as basic skills and GED (Brazzell et al., 2009; Department of Justice Federal Bureau of Prisons, 2016; Klein et al., 2004). We examined the literacy/numeracy

level of the inmates on the waiting lists and compared the proficiency level of those who wanted to participate in a program and those who did not. The hypothesis is that the inmates who wanted to participate and were on the waiting list are likely to have a higher proficiency and use more cognitive skills in prison life than those who did not want to but were (required to be) on the waiting list.

Proficiency

In a recent meta-analysis of 58 studies of the educational programs serving incarcerated adults, no more than four studies were found to be focused on skills and abilities – as measured by reading and math scores – as indicators of prison-based educational programs’ effectiveness (Davis et al., 2013). However, the authors of the meta-analysis pointed out that their analysis of reading and math achievement scores is narrowly focused on programs with computer-assisted instruction. Furthermore, other researchers (Tyler and Kling, 2004) found that while obtaining the GED is valuable for inmates and adds human capital to their post-release employment, there is little relationship between GED test scores and subsequent earnings among GED holders.

Literacy and numeracy proficiencies are better than GED scores as measures to be studied. While both literacy/numeracy proficiency and GED involve assessment scores, proficiencies measure the abilities to use skills in practice, whereas GED assesses the knowledge of specific content. International organizations, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO)’s Institute for Statistics, recommends that “the literacy and numeracy indicators should be based upon the definitions of literacy and numeracy used in the OECD’s PIAAC adult skill assessment program” (Murray, 2017, p. 2). The PIAAC definitions “are precise enough to be measured and broad enough to capture the entire range of skills encountered globally” (Murray, 2017, p. 2). For inmates who prepare for reentry into the

society, the literacy/numeracy skills assessed by PIAAC are essential to support their participating in the 21st-century economy. Therefore, it is paramount to investigate the connection of prison-based educational programs with literacy and numeracy proficiency rather than with achievement as measured by GED test scores reflecting content knowledge.

Evidence has shown that in the general adult population, poor literacy/numeracy skills not only limit people's access to better-paying and more rewarding jobs, but also seriously affect people's health, private and civic life (OECD, 2016). In our study, we focus on cognitive skills in the domains of literacy and numeracy given that the PIAAC assessments on literacy and numeracy were designed to reflect the changing nature of information, its role in society and its impact on people's lives, such as understanding the user information on a packet of medicine, comprehending pension entitlements, planning a working day, reacting appropriately to a memo from a colleague or superior at work, and enrolling a child in school (OECD, 2016). In today's information-rich societies, post-release life and work involve processing and analyzing all sorts of information, making decisions and solving problems. Low-skilled individuals are facing increasingly dim economic prospects, which becomes a factor that likely contributes to recidivism (Klein, Tolbert, Bugarin, Cataldi, & Tauschek, 2004; Tyler & Kling, 2004).

Cognitive Skill Acquisition. According to Klein, Tolbert, Bugarin, Cataldi, and Tauschek (2004), roughly half of the inmates who held a GED credential earned it during a prior incarceration, and the authors suggest that "a GED credential, in and of itself, does not confer substantial labor market advantages to GED holders" (p. 16). While inmates who earned a GED during incarceration are less likely to return to prison, policy makers expect the large investment in GED preparation programs to have a higher return, namely, an even lower rate of recidivism among inmates who earned a GED during their first incarceration. From this perspective, holding

a GED may not be enough for offenders to secure a post-release job, as “other factors also mediate the post-release success of prison parolees” (Klein et al., 2004, p. 16).

Patterson (2018) examined the low proficiency of low-educated inmates (i.e. education level lower than high school), using the 2012/14 PIAAC data. The study shows that low-educated inmates scored at the upper end of Level 1 for literacy skills, but at the lower end of Level 1 in numeracy. In other words, these incarcerated adults can only read relatively short texts to locate a single piece of information, recognize basic vocabulary, and evaluate the meaning of simple sentences. For numeracy, they could hardly solve problems involving one- or two-step processes requiring basic arithmetic or employing simple graphs. The researcher also found that among low-educated inmates pursuing formal education during the PIAAC survey, about 45 percent participated in basic skills instruction and nearly 56 percent in GED preparation activities. However, it is unclear how literacy and numeracy proficiency vary for participants in CTE programs.

In addition, GED holders need to continue acquiring skills that match the job market. Tyler and Kling (2004) found that GED holders did not have higher post-release earnings than inmates who had pursued but not earned their GED during incarceration. These findings suggest that while obtaining a GED may be an important step towards helping prepare inmates for reentrance into society and joining the labor market, a GED alone may be insufficient to guarantee gainful employment. At the same time, preventing skill stagnation or decline is just as important as promoting skill acquisition, therefore these programs may nevertheless have intrinsic quality (OECD, 2013).

Connections between Programs, Participation, and Proficiency

Most studies on prison-based educational programs use longitudinal data and evaluate the effectiveness of a program by measuring the change in the inmates' performance between pre- and post-tests. The reasoning here tends to be linear, going from the assumption that a) providing inmates with educational programs can improve the chance of post-release employment, to b) inmates can learn from programs provided and acquire skills needed for post-release employment to c) inmates who participated in programs should have higher literacy and numeracy than prior to incarceration and be better prepared for post-release life. However, this logic excludes proficiency as an indicator that connects with both programs and participation.

Most of these studies also link prison-based educational programs to labor market outcomes or use recidivism as the outcome variable to evaluate the effectiveness of programs (Davis et al., 2013; Newton, Day, Giles, Wodak, Graffam, & Baldry, 2018; Pompoco, Wooldredge, Lugo, Sullivan, & Latessa, 2017). Two limitations are often acknowledged if not addressed in these studies. One is selection bias, and the other, uncontrollable factors in post-release employment and life. For the former issue, differences detected between program participants and nonparticipants may reflect pretreatment attributes of the inmates who participated in the education programs in each study (such as participants being more motivated, having stronger internal locus of control, or being more proactive about planning for their post release future), and not the true effects of the programs themselves. The latter concern is related to the many post-release factors that can affect the inmates' chances to find employment and settle down after release (for example, the release location may have high unemployment or employment opportunities that do not match the released prisoner's skill-set, the individual may be living in a high poverty neighborhood, and so on).

Unfortunately, PIAAC is not a longitudinal study, hence these data cannot be used to evaluate the effect of educational programs on such outcomes as academic achievement, post release employment and recidivism. However, the data nevertheless provide an opportunity for us to explore the links between programs, participation, and literacy/numeracy proficiency by focusing on three pairs of interrelationships – program and proficiency, proficiency and participation, and program and participation.

Program and proficiency. Reentering society is a huge challenge for many offenders, particularly when they look for employment and struggle with lack of adequate education and job skills. “Most inmates re-enter society with no more skills than they had when they entered prison” (Klein & Tolbert, 2007, p. 284). Recidivism often relates to offenders’ post release situation and frustration, such as a lack of marketable skills and the stigma of a criminal record (Klein & Tolbert, 2007). A key purpose of prison-based educational programs is to improve inmates’ literacy/numeracy proficiency, “giving inmates the skills they need to succeed in the workplace and the community” (Klein & Tolbert, 2007, p. 285). Evidence shows that vocational training is more likely to enable inmates to find employment after release, but vocational programs often require inmates to have a certain level (e.g., high school) of literacy and numeracy. To a certain extent, the situation of low proficiency among the incarcerated population affects correctional education agencies to make decisions on which level or what type of programs to offer. When budget is limited, some prisons may offer basic literacy/numeracy courses rather than vocational training or postsecondary programs, for the number of inmates who need the basic level/type of programs is greater than those who need postsecondary or vocational training.

The goal of prison-based academic and vocational programs is to equip inmates with skills needed for their post-release life and employment (Tyler & Kling, 2004). As is known, a high percentage (30%) of incarcerated adults have an education level lower than high school, while in the general household population, this percentage is only 14% (Rampey, Keiper, Mohadjer, Krenzke, Li, Thornton, & Hogan, 2016). To help these inmates move forward, prisons throughout the country offer access to adult basic and GED preparatory programs (Klein et al., 2004). According to an earlier report by the Bureau of Justice (BOJ; Harlow, 2003), “about 9 in 10 State prisons, all Federal prisons, and almost 9 in 10 private prisons provide educational programs for their inmates” (p. 4). Educational programs in the BOJ report (Harlow, 2003) refer to all types of education programs, including basic adult education, secondary education, college courses, special education, vocational training, and study release programs. In 2000, approximately 80% of state prisons and 97% of federal prisons provided basic adult education; 84% of the former and 99% of the latter provided secondary education.

Secondary education programs, which focus on preparing for the GED, have been the most prevalent type of courses since 2000. Federal regulation Title 28 (28 CFR 544.70-544.75) states that inmates confined in federal prisons who do not have a verified General Educational Development (GED) credential or high school diploma are required to attend an adult literacy program for a minimum of 240 instructional hours or until a GED is achieved, whichever occurs first, and non-English-speaking inmates must take English as a Second Language (BOJ, 2018). In 2015, the U.S. Department of Education (2015) reported that in the Program Year 2011-12, 187,934 students self-reported entering adult education programs (i.e., adult basic education (ABE), adult secondary education (ASE), or English literacy programs) while in correctional facilities (i.e. state correctional facilities). The Bureau of Justice reported that 1,506,800

prisoners were under state and federal jurisdiction at the end of 2016 (Carson, 2018); it is unclear how many of the incarcerated took ABE, GED, and/or postsecondary programs. It should be noted that inmates who pass the GED or hold a high school diploma often find limited access to postsecondary degree programs or quality vocational training programs (Department of Justice Federal Bureau of Prisons, 2016; Klein et al., 2004).

Participation and proficiency. Inmates participate in prison-based programs to improve their literacy and numeracy, develop job skills, and increase chances of post-release employment (Rampey et al., 2016, p. 29). However, low literacy and numeracy levels often hamper the possibilities of some inmates to advance their vocational and/or academic preparation, and the lack of prerequisite qualifications is often cited as a barrier for low skilled inmates to participate in vocational or higher education (Davis et al., 2013; Pompoco et al., 2017). Meanwhile, a recent study (Rampey et al., 2016) reported that some inmates wanted to obtain vocational qualifications, but there were no programs available; the *2005 Census of State and Federal Correctional Facilities* found that only 52 percent of all reporting facilities offered vocational training, and the number of inmates who participated in such training programs went down from 1991 to 2004 (National Institute of Justice (NIJ), n.d.).

Our hypothesis here is that programs for the low-skilled inmate learners should prepare this vulnerable group for the next level of study and provide appropriate access to lifelong learning opportunities. Therefore, the goal of inmates' participation in academic programs such as basic skills acquisition and the GED is to reach a level of literacy and numeracy higher than what it was prior to incarceration (Ewert & Wildhagen, 2011; Harlow, 2003; Harlow, Jenkins, & Steurer, 2010), but obtaining a GED should not be the end of the learning process. Inmates should receive more educational or vocational training and become lifelong learners who

continuously use their acquired cognitive skills during incarceration as well as after release (Bayliss, 2003; Harlow 2003; Lynch and Sabol 2001).

Program and participation. This relationship is key to the effective management of correctional education programs (Department of Justice Federal Bureau of Prisons, 2016; Klein, Tolbert, Bugarin, Cataldi, & Tauschek, 2004). The federal law *Workforce Innovation Opportunity Act* (WIOA Title II) “includes a requirement that states provide corrections education ... (Section 225)” (U.S. Department of Education, 2015). According to the U.S. Department of Education (2015), WIOA expands the allowable programs components for corrections education with the goal of reducing recidivism; the expanded programs include career pathways, concurrent enrollment, peer tutoring, and transition to re-entry initiatives and other postrelease services. It should be noted that each state has different regulations for inmates’ participation in programs (U.S. Department of Education, 2015), although Federal law has specific regulates (§544.70).

It is important to point out that at the state level there are differences in practice based on state regulations and available resources. In Washington State (2011), the policies of placement priorities include “offenders who have obtained a high school diploma or GED certificate but score below the ninth grade level” (p. 7), and inmate participants are expected to participate in a minimum of 12 hours of instruction per week or each session the class is scheduled. In Ohio, prisoners without a high-school diploma or GED are required to participate in GED classes for a minimum of 6 months, if resources and sentence lengths permit, but in reality, many Ohio inmates never enter these classes because of long waiting lists (Pompoco et al., 2017). However, it is difficult to disentangle the relationship between participation and policies or practices related to enrollment and curriculum design. There is no record or measure of specific numbers

of hours spent in education programs, because of the policy of providing inmates with programs in a manner of using flexible schedule and offering open entry and open exit enrolment (Davis et al., 2013; Pompoco et al., 2017; Tobert, 2012). Therefore, one of our goals is to connect both programs and participation with proficiency, and then examine the relationship between programs and participation.

In summary, not all inmates need prison-based academic or vocational programs. However, programs should be properly targeted to the needs of individual participants (Newton et al., 2018). By doing so, programs are likely to be much more effective in a sense that prison-based programs would then support inmates' participation, and inmates would participate in programs that meet their needs.

Data and Methods

The PIAAC Survey of Incarcerated Adults (simplified as PIAAC US prison data) was conducted from February through June 2014 and targeted a nationally representative sample of incarcerated adults (ages 18 to 74) detained in state and federal prisons, and in private prisons housing state and federal inmates. In total, there were 98 participating prisons, and of the 1,546 inmates in the sample, 1,315 completed the prison background questionnaire (Rampey et al., 2016). Inmates in the PIAAC survey were assessed on their literacy, numeracy, and problem-solving skills in technology-rich environments; these were the same skill measures used in the U.S. PIAAC household study. The cognitive skills measured by PIAAC have been acknowledged as reasonable indicators for predicting employment, earnings and other human capital outcomes in the U.S. labor market (Holzer & Lerman, 2015).

Key Variables of Interest

Education level. In the PIAAC U.S. prison dataset, there is a three-category variable derived from the background survey question asking inmates about the highest level of education they had completed at the time the PIAAC survey was completed. We use this variable, with the education levels coded low, medium or high. Low education refers to less than a high school diploma, Medium to holding a high school diploma and/or having some college but not obtaining any post-secondary degree, and High to holding a college degree, such as Bachelor's, Master's, Doctorate or another professional degree.

Literacy/numeracy levels. PIAAC provides measures of literacy and numeracy proficiency in the form of plausible values, which are used to estimate scores, the ranges of which define proficiency levels for each domain. Based on the performance of the inmates on the PIAAC literacy/numeracy assessment, we used both the plausible values and the cut score of the PIAAC basic proficiency level (Level 2). The scale PIAAC uses to measure literacy or numeracy assessment ranges from 0-500; scores under 226 were categorized as “under Level 2,” while scores 226 or higher are “Level 2 and above” (OECD, 2013, p. 69). With literacy skills under Level 2, respondents can read brief texts on familiar topics to locate a single piece of specific information, recognize basic vocabulary or determine the meaning of sentences and paragraphs of text. With literacy skills at Level 2 or above, respondents can at least comprehend medium-length texts, either digital or printed, make match text with information, and make some inferences (OECD, 2013; Rampey et al., 2016).

For numeracy, with skills under Level 2, respondents can carry out one-step or simple processes involving counting, sorting, perform basic arithmetic operations, and/or understand simple percentages such as 50%, and identify elements of simple or common graphical or spatial

representations. With numeracy Level 2 or above, respondents should at least be able to apply two or more steps or processes involving calculation with whole numbers and common decimals, percentages and fractions. In addition, respondents with Level 2 or above in numeracy can understand measurement and spatial representation, as well as estimate and interpret simple data and statistics in texts, tables and graphs (OECD, 2016; Rampey et al., 2016).

Use of cognitive skills. In the PIAAC U.S. prison data, the construct of skills used in everyday life during the incarceration includes measures about the frequency of using reading, writing and numeracy skills. Eight items in the PIAAC background questionnaire tap literacy use in prison life – are (i) read directions or instructions, (ii) read letters or memos, (iii) read articles in newspapers, magazines or newsletters, (iv) read books, fiction or non-fiction, (v) read manuals or reference materials, (vi) write letters or memos, (vii) write reports, and (viii) fill in forms.

Numeracy in the PIAAC survey is linked to the concept of “numerate behavior,” which involves “managing a situation or solving a problem in a real context by responding to mathematical information and content represented in various ways” (OECD, 2013, p. 20). Considering the practical use of mathematics in life, we used seven items in the PIAAC background questionnaire to tap mathematical skills or numeracy use in prison life – (i) calculate prices, costs or budgets, (ii) use or calculate fractions, decimals or percentages, (iii) use a calculator – either hand-held or computer-based, (iv) prepare charts, graphs or tables, (v) use simple algebra or formulas, (vi) read bills, invoices, bank statements or other financial statements, and (vii) read diagrams, maps, or schematics.

The sparse frequency distributions of these items limited their direct use, leading us to generate two separate measures of literacy and numeracy activities. In particular, we first collapsed each item and coded any reference to use of skills as 1 and no use of skills as 0. We

then summed these recoded items to generate an index of literacy use and another one for numeracy use. The literacy index ranges from 0 to 8 while the numeracy index ranges from 0 to 7; 1 means using one of the literacy or numeracy skills, and 8 means using all of the literacy skills (7 meaning using all of numeracy skills). Zero represents not using any literacy or numeracy skills.

As Table 1 shows, the respondents reported using a greater number of the different types of literacy skills than the different types of numeracy skills in their prison life. In the sample, a large proportion of inmates (52%) have a numeracy level below the basic proficiency level (Level 2). In contrast, the proportion of inmates with a literacy level below Level 2 is 29 percent. Although this difference is noticeable among the household population, the low numeracy exacerbates the reentry situation of offenders. Bynner and Parsons (1998) state that reading skills are more resilient for the unemployed individuals, but numeracy skills are more likely to be lost when low-educated people are out of work. Since a high percentage of inmates drop out of high school and spend time in prison, it is more important for inmates to develop numeracy skills through educational programs and/or jobs in prison. Therefore, we examined the relationship between program and participation, using literacy and numeracy proficiency as a proximal indicator.

Table 1

Descriptive Statistics for the PIAAC US Prison Sample

Variables	Description	Mean (SE)	SD	n
<i>Dependent Variables</i>				
Use of literacy skills in everyday life in prison	0 = not use any literacy skills 1 ... 8 = count of the number of literacy skills often used in everyday life in prison	5.148 (.068)	1.928	1296
Use of numeracy skills in everyday life in prison	0 = not use any numeracy skills 1 ... 7 = count of the number of numeracy skills often used in everyday life in prison	2.227 (.077)	1.861	1299
<i>Independent Variables</i>				
Completed a level of education in prison	1 = Completed an education level during the current period of incarceration 0 = No further education level completed	40.3% (.018)		1299
Participated in vocational programs	1 = Participated in readiness class and/or job training program 0 = Not participated in readiness class or job training program	37.8% (.015)		1299
Proficiency level	1 = Level 2 or above Level 2 (\geq 226) 0 = Below Level 2 ($<$ 226)			1301
Literacy	(weighted)	70.5% (.017)		
Numeracy		47.5% (.017)		
Gender (Male)	1 = Male; 0 = Female	93.1% (.001)		1208
Age (Millennial)	1 = under 35 years old; 0 = 35-65 years old	48.4% (.015)		1208
Race		(Total 100%)		(Total N=1299)
White (reference)		33.9% (.011)		505
Black		36.8% (.004)		437
Hispanic		22.1% (.004)		266
Other		7.2% (.010)		91
Want to enroll in an academic class	1 = Want to enroll; 0 = Not want to enroll	70.3% (.016)		1082

Note: SD = standard deviation; n = observed cases

Analytic Strategy

When engaging our research questions, we rely on one of three approaches – weighted percentages, weighted means and standard errors, and ordered logit models – depending upon the research question and data available. When weighted percentages or means are compared across groups we employ the Dunn-Sidak adjusted α value instead of a standard α value of 0.05 or 0.01. The Dunn-Sidak approach offers higher power than other approaches and is highly recommended if the number of tests is greater than 1 ($k > 1$) (Abdi, 2007).

The ordered logit models were appropriate to analyze the data in which we were interested, given the ordered nature of the numeracy and literacy use indices we generated. Of course, we could experiment with a count data model here, but the ordered logit models were easier to estimate within the confines of the weighted data and Stata's *svy* options. The ordered logit models allow us to look at whether inmates who participate in academic or vocational programs are likely to use more literacy and numeracy skills in prison than non-participants. We tested the proportional odds assumption (by fitting the constrained generalized ordered logit – *gologit2* – in Stata), and the proportional odds assumption underlying ordered logistic regression is not violated (Williams, 2005).

Results

We report the key relevant results of our analyses by answering each research question we proposed at the beginning of this paper.

Research Question 1: What are the characteristics of the incarcerated population, relative to the household population (in PIAAC), vis-a-vis education levels and literacy/numeracy levels? How

do inmates differ from the household population in terms of use of cognitive skills in life and at work?¹

Education levels. Compared to the population who participated in the U.S. PIAAC household survey, the majority of the surveyed incarcerated population in the U.S. PIAAC prison data have low to medium level education (Figure 1). In the household population, 36 percent have high-level education (college degrees); 50 percent have medium-level (high school diploma and/or some college without degree); only 14 percent have low-level education (no high school diploma). In contrast, only 6 percent of the inmates have high-level education, while 64 percent have medium-level, and 30 percent, low-level education.

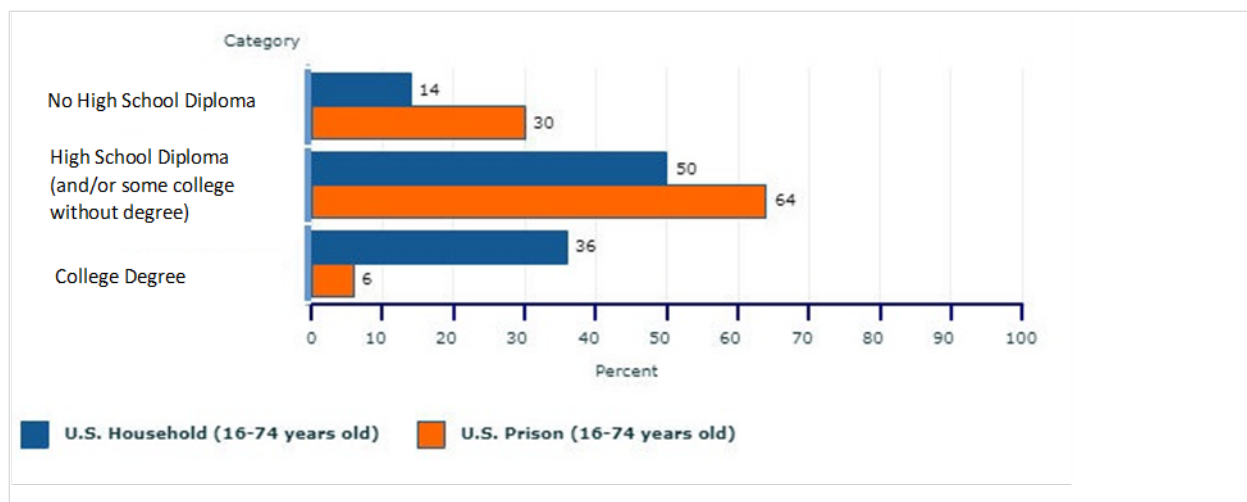


Figure 1. Percent of low, medium and high educated individuals in the U.S. PIAAC survey: Comparison of the incarcerated population with the household population

¹ For this question, the PIAAC Data Explorer on the National Center for Education Statistics (NCES) website was used.

Proficiency. In terms of proficiency, the literacy scores of inmates with low or medium education, on average, are close to the scores of individuals of the same education level in the household population, but this is not the case with high education (the average literacy score of inmates with high education is 21 points lower than that of their household peers; this difference is statistically significant). The average literacy score of inmates with low-level education ($Mean = 224, SD = 41$) has no statistically significant difference from that of individuals with low-level education in the household population ($Mean = 226, SD = 51$). Likewise, the average literacy score of inmates with medium-level education ($Mean = 259, SD = 43$) has no statistically significant difference from that of individuals with medium-level education in the household population ($Mean = 262, SD = 45$). However, 29 percent of the inmates have literacy below Level 2, whereas in the household population, only 19 percent have such low literacy.

By contrast, the numeracy scores of inmates are significantly lower than the scores of individuals from the household population. The average numeracy score of inmates with low-level education ($Mean = 187, SD = 49$) is significantly lower (approximately 21 points lower) than that of individuals with low-level education from the household population ($Mean = 208, SD = 53$). Similarly, the average numeracy score of inmates with medium-level education ($Mean = 233, SD = 48$) is significantly lower (approximately 13 points lower) than that of individuals with medium-level education from the household population ($Mean = 246, SD = 50$). Appallingly, 52 percent of inmates have numeracy level below Level 2, whereas in the household population, only 29 percent of individuals have such low numeracy level.

Use of cognitive skills. Compared with the household population, a large proportion of inmates do not use literacy/numeracy skills in life or work during the incarceration, particularly when it comes to numeracy (Figure 2). As shown in Table 2, in everyday life, 58 percent of the

inmates reported that they never or rarely (i.e., less than once a month or less than once a week but at least once a month) use fractions, decimals or percentages, and 65 percent reported that they never or rarely use a calculator, either hand-held or computer-based. Due to the nature of incarceration, some cognitive skills are rarely used in prison life. For instance, about 71 percent of the inmates (who had jobs during incarceration) reported that they never or rarely read bills, invoices and financial statements, and 82 percent do not read diagrams, maps and schematics. By contrast, only 19 percent of individuals (who had employment) from the household population reported that they never or rarely read bills, invoices and financial statements.

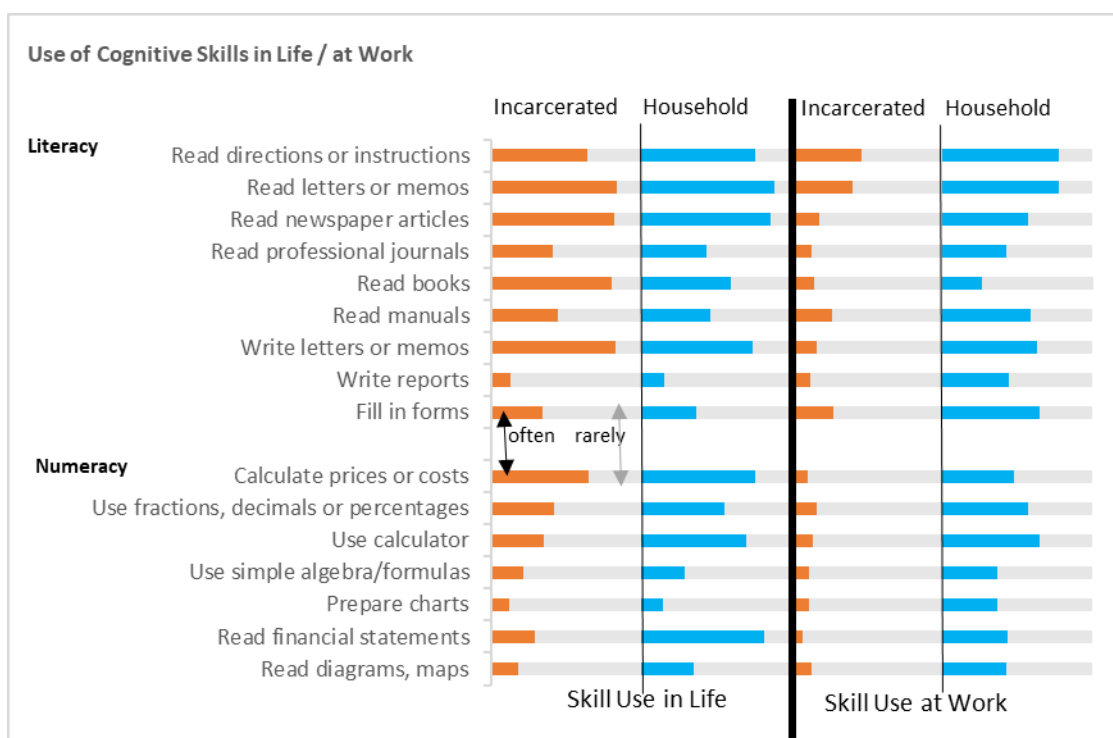


Figure 2. Comparison of percentage of use of cognitive skills in life and at work between the incarcerated and the household population

Table 2

Use of Numeracy Skills in Everyday Life: Comparison between Inmates and Household Population

Group	Skill Use in Life		Skill Use at Work	
	Incarcerated	Household	Incarcerated (Prison Job)	Household
	Weighted %	Weighted %	Weighted %	Weighted %
Calculate prices, costs or budgets				
At least once a week or everyday	64.6	75.3	10.3	47.6
Never or rarely	35.4	24.7	89.7	52.4
Use/calculate fractions, decimals or percentages				
At least once a week or everyday	42.1	55.5	16.1	57.1
Never or rarely	57.9	44.5	83.9	42.9
Use a calculator – either hand-held or computer-based				
At least once a week or everyday	34.8	69.9	14.1	64.9
Never or rarely	65.2	30.1	85.9	35.1
Use simple algebra or formulas				
At least once a week or everyday	21.4	28.7	11.0	36.4
Never or rarely	78.6	71.3	89.0	63.6
Prepare charts, graphs or tables				
At least once a week or everyday	11.6	14.1	10.1	31.7
Never or rarely	88.4	85.9	89.9	68.3
Read bills, invoices, and financial statements				
At least once a week or everyday	29.4	81.3	6.7	43.2
Never or rarely	70.6	18.7	93.3	56.8
Read diagrams, maps, or schematics				
At least once a week or everyday	17.8	34.7	13.0	42.6
Never or rarely	82.2	65.3	87.0	57.4
Total N	1301	8479	793	6191

Information about use of literacy and numeracy skills at work in the household population is useful in that it increases our knowledge about possible job requirements that inmates may be facing after release. As shown in Table 3, for literacy, in the household population, approximately 78 percent of individuals reported that they need to read directions

and instructions at least once a week or every day at work; 59 percent often read manuals or reference materials at work; 44 percent write reports every day or at least once a week; and 65 percent fill in forms at least once a week or every day at work. By contrast, most inmates reported that they never or rarely fill in forms in prison life (66%) or at their prison jobs (73%), and never or rarely write reports in prison life (87%) or at their prison jobs (88%).

Table 3

Use of Literacy Skills in Everyday Life: Comparison between Inmates and Household Population

Group	Skill Use in Life		Skill Use at Work	
	Incarcerated	Household	Incarcerated (Prison Job)	Household
	Weighted %	Weighted %	Weighted %	Weighted %
Read directions or instructions				
At least once a week or everyday	63.9	75.2	46.6	77.7
Never or rarely	36.1	24.8	53.4	22.3
Read letters or memos				
At least once a week or everyday	83.4	88.2	40.4	75.4
Never or rarely	16.6	11.8	59.6	24.7
Read articles in newspapers, magazines or newsletters				
At least once a week or everyday	82.1	85.7	18.4	57.3
Never or rarely	17.9	14.3	81.6	42.7
Read articles in professional journals or scholarly publications				
At least once a week or everyday	40.6	43.4	13.3	42.5
Never or rarely	59.4	56.6	86.7	57.5
Read books, fiction or non-fiction				
At least once a week or everyday	80.0	59.4	15.1	26.5
Never or rarely	20.0	40.6	84.9	73.6
Read manuals or reference materials				
At least once a week or everyday	44.5	45.6	27.0	59.0
Never or rarely	55.5	54.4	73.0	41.0
Write letters or memos				
At least once a week or everyday	82.5	73.9	16.4	63.0
Never or rarely	17.5	26.1	83.6	37.0

Write reports				
At least once a week or everyday	13.1	15.1	12.3	44.3
Never or rarely	86.9	84.9	87.7	55.7
Fill in forms				
At least once a week or everyday	33.8	36.6	27.5	64.8
Never or rarely	66.2	63.4	72.5	35.2
Total N	1301	8479	793	6190

In summary, low education level, low proficiency level and low rate of skill use are the reality of the incarcerated population.

Research Question 2: How do participants in different types of prison-based educational programs (such as basic skills, General Equivalency Degree (GED), employment readiness and job training) perform in literacy and numeracy proficiency? That is, does proficiency vary by program?

To have a clear picture of the literacy/numeracy performance of inmates who participated in prison-based programs, we separately compared participants in basic skills, GED, employment readiness, and job training programs, with inmates who had an education level below high school diploma and were not involved in any programs (reference group). Overall, inmates who had no high school diploma but were involved in any of the four types of prison-based programs performed higher than the reference group in both literacy and numeracy.

As Table 4 shows, inmates who did not reach high school level and did not participate in any programs had the lowest literacy and numeracy, and on average, their numeracy was below Level 2. By contrast, inmates who participated in basic skills programs performed significantly higher than the reference group in both literacy and numeracy. However, among inmates without high school diploma or equivalent, the difference in literacy and numeracy between participants and non-participants in basic skills programs is not statistically significant.

Table 4

Program (Basic, GED, Readiness and Job Training), Participation during the Current Incarceration, and Proficiency

Group		Count <i>n</i>	Weighted %	Literacy		Numeracy	
				<i>Mean</i>	<i>SE</i>	<i>Mean</i>	<i>SE</i>
A	Not participated in any program & no high school diploma (HS) (reference group)	126	27.8	221.18	4.65	180.66	5.38
B	Not participated in any program & HS, no college degree	322	72.12	258.50	2.32	231.58	3.49
	Total	448	100.0				
³ C	Participated in Basic Skills Program	328	29.81 ¹	233.67*	2.39	201.75**	3.40
⁴ C1	No HS	181	54.4 ²	221.46	3.36	186.70	4.35
⁵ C2	HS, no college degree	147	45.6 ²	248.24*	3.38	219.72*	4.33
³ D	Participated in GED Program	365	32.9 ¹	237.70**	2.36	206.91***	3.19
⁴ D1	No HS	223	60.0 ²	226.00	2.95	192.24	3.81
⁵ D2	HS, no college degree	142	40.0 ²	255.27	3.01	228.95	4.00
³ E	Participated in Employment Readiness	327	24.8 ¹	252.36***	2.88	224.77***	3.17
⁴ E1	No HS	76	22.9 ²	228.06	4.83	192.22	6.58
⁵ E2	HS, no college degree	229	71.2 ²	258.24	3.44	231.85	3.53
E3	College degree	22	†	†		†	
³ F	Participated in Job Training	304	24.1 ¹	257.42***	3.08	234.80***	3.11
⁴ F1	No HS	41	13.0 ²	228.08 ¹	11.7	183.76 ¹	18.96
⁵ F2	HS, no college degree	221	74.6 ²	261.54	3.28	237.84	3.29
F3	College degree	39	12.4 ²	277.53 ¹	9.89	270.99 ¹	9.87

Note:

There are 4 independent tests and used Dunn-Sidak adjust α . * $p < .05$, ** $p < .013$, *** $p < .001$

¹Interpret data with caution

#Reporting standards not met

¹Percent out of the incarcerated population

²Percent out of the inmates who participated in the same type of program

³Significance tests were conducted on the comparisons of the average scores of literacy and numeracy between A group and C, D, E, F group respectively.

⁴Significance tests were conducted on the comparisons of the average scores of literacy and numeracy between A group and C1, D1, E1, F1 group respectively. We did not find any statistically significant between groups.

⁵Significance tests were conducted on the comparisons of the average scores of literacy and numeracy between B group and C2, D2, E2, F2 group respectively. We found that among inmates who had high school diplomas, the average scores of inmates who participated in basic skills program in literacy ($t = -2.59, p = 0.01$) and numeracy ($t = -2.31, p = 0.02$) were significantly lower than their peers who did not participated in the programs (i.e., basic skills, GED, employment readiness, and job training).

We also compared the proficiency of participants in each type of program with that of inmates who had high school diploma but were not involved in any program. The results show that inmates who participated in basic skills and GED programs performed significantly lower in literacy/numeracy than non-participant inmates with high school diploma/some college but no degree (HS reference group). We did not find any significant difference in literacy/numeracy average scores between HS reference group and inmates who participated in employment readiness and/or job training. The number of inmates who had college degrees is small and does not meet the PIAAC reporting standard, therefore, we did not include any report on this population here.

Participants in GED programs performed significantly higher than non-participants who did not obtain a high school diploma (reference group) but scored significantly lower than non-participants with a high school diploma (HS reference group). This result suggests that GED, or high school diploma, is a proficiency level benchmark that inmates should strive to reach. Evidence shows that finishing high school or GED is key to having a higher level of literacy and numeracy. This higher level, compared with that of high school dropouts, results in more skills to support one's employment (Rumberger, 1987).

Table 4 also shows that approximately 72 percent of inmates who were not involved in any program had high school diploma. It is only natural to ask ourselves why some inmates who reach a certain level of literacy/numeracy do not continue their postsecondary education. Types of crime committed, length of sentence, security- and health-related issues may all affect inmates' participation in correctional education programs. However, previous studies point out that limited availability of or accessibility to programs, lack of information, and poor support from prison administration are all factors that may impact the decision of inmates to participate,

or not, in correctional education programs (Edwards-Willey & Chiver, 2005; Meyer, Fredericks, Borden, & Richardson, 2010; Walsh, 2000; Winterfield, Coggeshall, Burke-Storer, Correa, & Tidd, 2009).

As Figure 3 shows, the percentage of participation in vocational programs is higher among inmates with a high school diploma than among those without. One possible reason is that inmates with a high school diploma qualify for vocational programs, while those without do not. Previous studies support this reasoning. For instance, according to Lawrence, Mears, Dubin and Travis (2002), while the eligibility criteria to participate in vocational training vary across correctional facilities, some institutions require inmates to complete a certain level of education (usually a high school diploma or GED) before participating. The purpose of this requirement is to ensure that inmates have the basic skills and abilities needed to complete training (Lawrence et al. 2002).

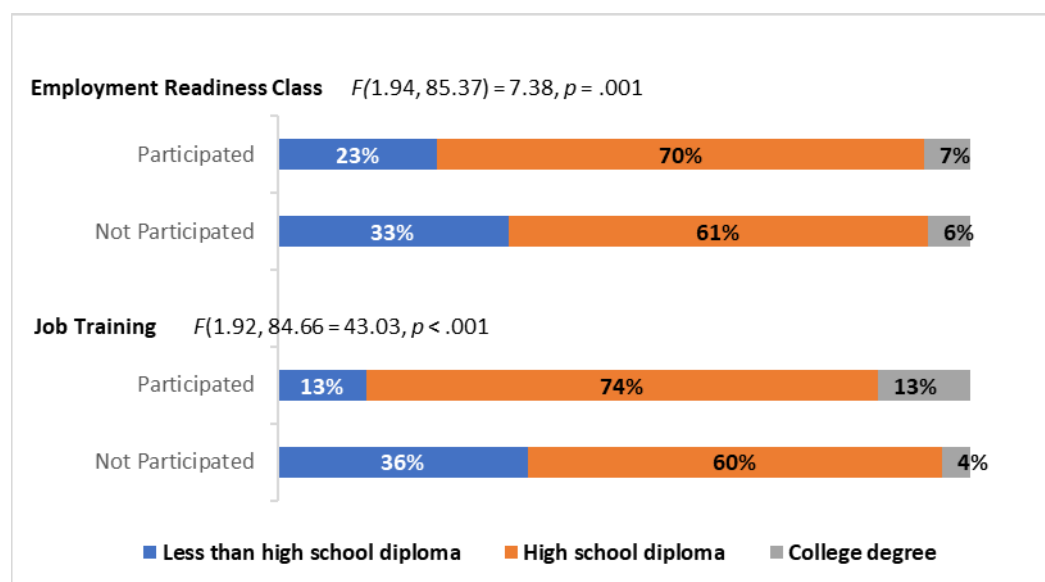


Figure 3. Participation in vocational programs by inmates' education level

Research Question 3: What are the reasons reported by inmates for participating (or not) in the academic or vocational programs?

Reasons for participation. As Table 5 shows, most participants reported that they attended prison-based educational programs to increase their chances for employability or just self-improvement; only a small number of inmates reported being required to participate. For instance, among the inmates who enrolled in basic skills programs, 73 percent wanted to improve themselves or increase employability, whereas 16 percent enrolled because they were required. Among the inmates who completed a level of education during the incarceration, 79 percent completed a level of education higher than the level they had prior to prison to increase employability or for self-improvement, while only 11 percent did so because they were required. Within vocational programs, 77 percent of inmates who participated in readiness classes reported doing so to increase their chances of employability or for self-improvement; 19 percent said they were required to participate.

Table 5

Reasons Inmates Reported for Participating in Academic/Vocational Programs

Group	Count (<i>n</i>)	Weighted %	Literacy		Numeracy	
			Mean	SE	Mean	SE
Academic – Participate basic skills						
Required (Comparison Group)	80	16.1	223.20	4.70	189.95	6.32
Increase employability & Self-improvement	327	73.2	241.27**	2.39	209.45**	3.33
Other	47	10.8 [!]	‡	‡	‡	‡
Total	454	100.0				
Academic – Complete a level of education						
Required	60	11.2 [!]	‡	‡	‡	‡
Increase employability & Self-improvement	414	79.4	256.08	2.20	229.39	2.73
Other	51	9.4 [!]	‡	‡	‡	‡

Total	525	100.0				
Academic – Want to enroll						
Required	6	‡	‡	‡	‡	‡
Increase employability & Self-improvement	775	93.6	252.88	1.60	223.27	2.30
Other	47	5.7 ¹	‡	‡	‡	‡
Total	828	100.0				
Vocational – Participate in job training						
Required	12	‡	‡	‡	‡	‡
Increase employability & Self-improvement	396	88.2	260.15	2.63	234.95	2.97
Other	39	9.2 ¹	‡	‡	‡	‡
Total	447	100.0				
Vocational – Participate in readiness Class						
Required (Comparison Group)	66	18.5	256.02	5.00	228.12	5.71
Increase employability & Self-improvement	250	77.4	250.76	3.50	223.22	3.87
Other	11	‡	‡	‡	‡	‡
Total	327	100.0				

Note 1: PIAAC reporting requirement: ¹ interpret data with caution. ‡ Reporting standards not met.

Note 2: There are 5 independent tests and used Dunn-Sidak adjust α $**p < .01$, $***p < .001$.

Reasons for not participating. Table 6 shows the reasons inmates reported for not participating in academic or vocational programs during their incarceration. Among the respondents who do not want to enroll in an academic classes or programs of study, 19 percent reported that they did not have the qualifications necessary to enroll in the program offered by their prisons or they wanted to enroll in a higher level of classes than were available in the program provided by their prisons. Approximately 20 percent reported that the quality of the programs offered was poor or the academic classes offered were not useful. Approximately 61 percent listed other reasons for not participating in the prison-based academic programs, such as “the waiting list is too long,” or “I have a volunteer/work assignment I do not want to give up to attend classes.”

We found that not meeting prerequisites is one of the main reasons why inmates did not attend a course or program to learn job skills or job training (see Table 6). Among the inmates who did not participate in job training programs, 41 percent reported said they were not eligible for whatever reason or otherwise lacked educational qualifications. Approximately 40 percent listed other reasons for not participating, such as they were on the waiting list. Only 19 percent said they were not interested in the programs offered.

Table 6

Reasons Inmates Reported for Not Participating in Academic/Vocational Programs during Incarceration

Group	Count (n)	Weighted %	Literacy		Numeracy		
			Mean	SE	Mean	SE	
Academic – Reason for Not Participating							
Not eligible or Not available (Comparison Group)	64	18.7	229.83	9.55	193.93	8.42	
Poor quality or Not useful	66	20.0	242.30	7.49	216.65	8.33	
Other or Waiting list or Volunteer job	223	61.2	247.44	3.73	216.01*	3.92	
Total	353	100.0					
Job Training – Reason for Not Participating							
Not eligible (Comparison Group)	350	40.7	240.10	2.77	208.27	3.62	
Not interested	159	19.0	241.59	4.27	209.26	4.94	
Other or Waiting list	341	40.3	248.19	2.75	220.03*	3.45	
Total	850	100.0					

Note: There are two independent tests and used Dunn-Sidak adjust α * $p < .025$.

Proficiency. As shown in the above tables (Table 5 and 6), the average literacy and numeracy levels of inmates differ across groups with different reasons for participation or not participation in academic or vocational programs. Due to sample size constraints, some comparisons we conducted do not meet the reporting standards from the National Center for Education Statistics (NCES). If we ignore this caveat, some meaningful results are visible. For

instance, in Table 5, inmates who participated in the basic skills program because they were required to do so have lower levels (under Level 2) in literacy and numeracy, compared with those who participated in the same type of programs to increase employability or for self-improvement. In Table 6, among non-participants, inmates who reported reasons such as being on the waiting list or others, on average, performed better on numeracy than those who had issues of eligibility or educational qualifications.

In summary, most of the participants attended prison-based educational courses, either academic or vocational, to improve themselves or increase their chances of employability. By contrast, two fifths of the inmates who did not participate in job training reported that they had various eligibility issues.

Research Question 4: How do inmates with different participation trajectories in prison-based educational programs perform in literacy and numeracy? How do inmates who take courses at different venues and spend different amounts of time taking courses perform in literacy and numeracy?

Participation. We examined three types of trajectories related to the participation of inmates in prison-based educational programs (see Table 7). The first type involved the willingness of inmates to participate in academic programs. Approximately 30 percent of the respondents expressed no desire to participate in academic programs, while 70 percent wanted to enroll in academic classes. A little more than half of the inmates (53%) wanted to enroll in academic programs and were not on the waiting list. This group of inmates, on average, have significantly higher literacy and numeracy than the inmates who expressed no willingness to participate in any academic program.

Table 7

Inmate's Trajectories of Participation in Academic/Vocational Programs, and their Proficiency

Group	Count (<i>n</i>)	Weighted %	Literacy		Numeracy	
			Mean	SE	Mean	SE
Academic Programs (all levels)						
Want to enroll, on waiting list	210	17.6	250.42	3.19	219.32	4.17
Want to enroll, not on waiting list	612	52.8	252.92**	1.77	224.23**	2.20
Not want to enroll (Comparison Group)	348	29.6	242.36	3.27	211.68	3.76
Total	1170	100.0				
Academic Programs (all levels)						
Completed, and studying	136	10.3	244.65	5.14	218.65	6.21
Completed, not studying	388	31.6	257.75**	2.28	230.15**	3.20
Not completed, studying	153	11.0	239.62	4.60	206.80	5.46
Not completed, not studying (Comparison Group)	622	47.2	246.83	2.59	217.79	3.16
Total	1299	100.0				
Job Training						
On waiting list	146	10.8	264.54***	4.23	236.38***	5.67
Participated	301	22.6	^a 258.38***	3.22	^b 234.90***	3.18
Did not participate (Comparison Group)	853	66.6	243.62	1.48	213.11	2.08
Total	1296	100.0				

Note 1: There are two independent tests and used Dunn-Sidak adjust α ** $p < .017$. *** $p < .001$.

Note 2: ANOVA cannot be conducted using Stata “svyset” because assumptions that cases are independent of each other are violated.

Note 3: After controlling for current education level, the difference in ^aliteracy between participants and non-participants in job training is not statistically significant, but the difference in ^bnumeracy is statistically significant ($p < .05$).

The second type of participation involved the completion of and continuation in academic learning. Approximately 47 percent of inmates are non-participants. They did not complete any higher level of education during incarceration, compared to their previous level, nor were studying for any kind of formal degree or certificate during the current incarceration. Approximately 11 percent of the inmates who reported no further education level completed during the time of the survey were studying for a formal degree or certification, while 10 percent

completed a level of education and continued studying for a formal degree or certificate. Approximately 32 percent of the inmates completed a level of education but stopped studying for a formal degree or certificate. We did not find a significant difference in literacy and numeracy between inmates who completed a higher education level but stopped studying academic programs and those who completed a higher education level and continued studying. However, inmates who completed a higher education level and stopped studying academic programs, on average, have higher literacy and numeracy than non-participants.

The third type of trajectory is related to participation in job training. Approximately two thirds of the respondents (67%) did not participate in programs that help them to develop job skills, including computer skills. Only 23 percent participated in job training programs, and about 10 percent were on the waiting list. On average, the numeracy level of inmates who participated in or were on the waiting list for job training is Level 2 or above, which exceeds the numeracy level of participants in basic academic programs, such as basic skills and GED, and both their literacy and numeracy are significantly higher than that of non-participants.

After controlling for inmates' current education level, on average there is no statistically significant difference in literacy between participants and non-participants in vocational training, but the difference in numeracy is statistically significant, namely participants had higher numeracy than non-participants. Additionally, for inmates with the same education level, those who were on waiting lists for vocational training had significantly higher literacy (*Difference* = 15.56, *SE* = 4.35, *p* = .001) and numeracy scores (*Difference* = 16.23, *SE* = 4.79, *p* = .001) than non-participants. We also noted that one in five inmates on waiting lists for vocational training had not reached high school education levels. However, it is unclear whether they were placed

on waiting lists because they were expected to complete GED/high school credentials or because they had adequate academic levels and wanted to participate in job training.

The analyses of the three types of participation behaviors led us to rethink the interrelationship between program and participation. Figure 4 shows that among inmates who did not participate in job training, more than half (52%) did not participate in any academic program, either. We also noted that 40% of job-training participants completed an education level during the incarceration but stopped studying for academic programs. This result suggests that when inmates completed a higher level of education, they acquired enough literacy and numeracy (such as Level 2 or above) to let them move forward to CTE and get better prepared for post-release employment.

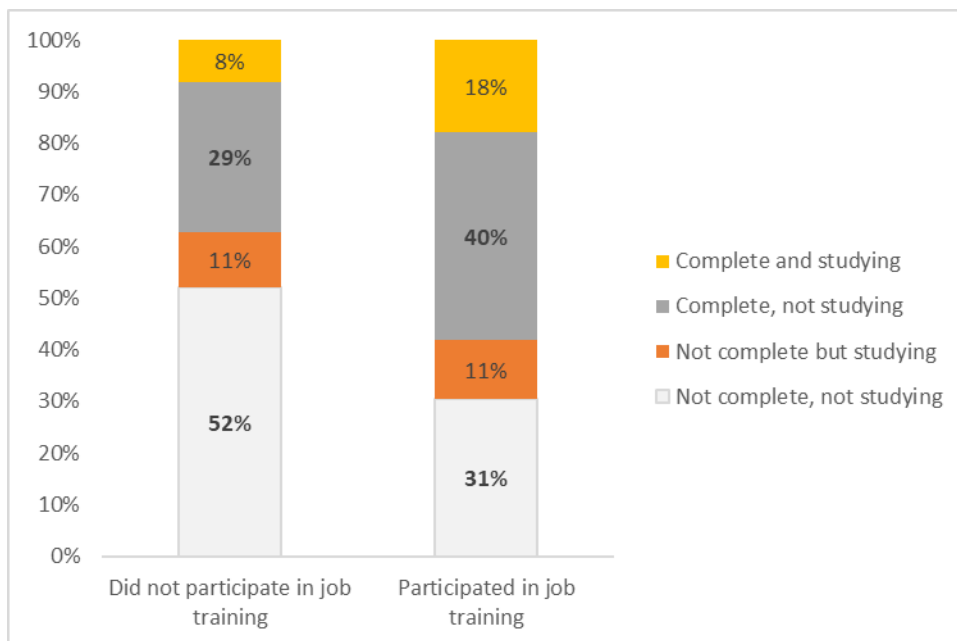


Figure 4. Distribution of inmates' participation in academic programs within job training participation

Venues. Most academic programs are offered within prison premises; the courses about basic skills and GED are mostly delivered in correctional facilities. Among the inmates who completed the highest level of education during their current period of incarceration, two thirds (66%) reported that their course of study was offered in prison, jail or correctional facility, while one third (34%) said that their programs were offered in various off-site venues. Those venues include courses offered by a four-year college or university, a community college, a high school or vocational secondary school, or through independent study, or correspondence/distance education.

For job-related certificates, training programs are often offered outside correctional facilities. Less than one half of the inmates (46%) who reported having prepared for information technology or other job-related skill certifications attended classes offered by prison to prepare for the test, whereas more than half (56%) participated in courses for job-related skill certifications offered at off-site facilities. The venues outside prison include classes offered by a four-year college or university, a community college, a technical school or private vendor, a high school or vocational secondary school, and programs through apprenticeship or independent study. We explored the average literacy and numeracy scores across groups of inmates who took courses from different venues or spent different amounts of time taking courses and did not find any statistical differences.

Time spent on participation in programs. As literature indicates, it is difficult to find a widely-used measure that accurately tells how long inmates participate in a given program, for “the amount of time that they spent in any given program was rarely reported” (Bazos & Hausman, 2004; Davis, Bozick, Steele, Saunders, & Miles, 2013, p. xvi). In the PIAAC survey, inmates were asked directly how much time they spent participating in academic and vocational

programs. Since there are great variations in the unit used to calculate time, we differentiated four categories – a) under 6 months; b) 6 months to a year; c) 1-2 years; and d) above 2 years. If the respondents reported in hours, days, or weeks, we converted the time to months and years using the equation that one year equals 180 school days, 5 days a week, and 4 hours per day. Among the inmates who completed the highest level of education during the current period of incarceration, 47% spent fewer than 6 months; 22% spent 6 to 12 months; 11% spent 1-2 years; and 19% spent more than 2 years. Among inmates who completed less than high school levels of education, 54% spent fewer than 6 months. Among inmates who completed a high school diploma or pre-associate education, 57% spent fewer than 6 months and 20% spent 6-12 months. Among inmates who completed a college degree, 35% spent more than 2 years. We did not find statistically significant differences in literacy or numeracy average between inmates spending fewer than 6 months to complete an academic program and those spending more than 6 months, even after controlling for current education levels and prison terms.

Only 23% of inmates had participated in a job skill or job training program, for example, a computer skills program that teaches Microsoft Word, during their current incarceration (see Table 7). For time spent in the job-training course or program during incarceration at the time of PIAAC survey, 75% of inmates spent 40 hours or less (*Range*: 1 – 250 hours, *Mean* = 56.7, *SD* = 80.88), while 75% of inmates scheduled 35 hours or less (*Range*: 1 – 250 hours, *Mean* = 48.1, *SD* = 75.97). After controlling for current education level, we did not find any statistically significant relationship between hours spent (or scheduled) in job training and literacy/numeracy scores.

Research Question 5: Do inmates who participate in prison-based academic and/or vocational programs use more literacy and numeracy skills in their prison life, compared with non-participants?

So far, we have found that the proficiency level of the inmates who completed a level of education during the incarceration is significantly higher than that of those who did not. Moreover, the inmates who participated in vocational programs in prison have significantly higher proficiency level than those who did not. Theoretically, with higher proficiency, individuals may use more literacy and numeracy skills in their everyday life; using reading and numeracy in more contexts can preserve and sharpen those already acquired skills (Bynner & Parsons, 1998).

Our hypothesis is that inmates who completed a higher level of education during incarceration and/or participated in vocational programs during incarceration used more cognitive skills in their prison life. Given the ordinal nature of the dependent variable we rely on the ordinal and generalized ordinal logit models that allow us to take the survey weights into account and estimate the partial proportional odds. Two ordinal logistic regression models were conducted to examine the relationship. As shown in Table 8, inmates who participated in vocational programs are likely to use more literacy and numeracy skills in their prison life than the non-participants. In contrast, completion of a level of education does not show such relationship with skills use. In other words, the ordered log odds for inmates who completed an education level in prison to use more literacy/numeracy skills are not statistically different from those of inmates who reported not completing any further education.

Table 8

Ordinal log odds (logit) of Literacy/Numeracy Use in Prison Life Depending on Participation in Prison-based Programs

Dependent Variable (DV):	Literacy		Numeracy	
Number of skills				
Independent Variable (IV):	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>
Completed an education level	.08	.096	.01	.111
Participated in vocational program	.87***	.103	.52***	.122
Proficiency Level 2 or above ³	.63***	.165	.22	.136
Male	-.29 ¹	.136	-.34	.180
Millennial	-.07	.100	.30 ^{1*}	.112
Race (comparison group: White)				
Black	.35 ^{1**}	.127	-.11	.102
Hispanic	-.08	.144	-.36 ^{1*}	.142
Other	.25	.266	.27	.240
Want to enroll in an academic Class or program of study	.46***	.122	.55***	.110
Number of observation	1,170		1,171	
Test for the proportional odds assumption	$\chi^2 (49) = 51.59$		$\chi^2 (42) = 45.19$	
<i>p</i>	.373		.340	

Note 1: *SE* = standard error. *** $p < .001$. ** $p < .01$, * $p < .05$

Note 2: PIAAC reporting requirements: ¹ The coefficient of variation (CV), i.e., the standard error divided by the estimate, is between 30% and 50%.

Note 3: The generalized ordinal logistic models show that except literacy/numeracy, the proportional odds assumption was met. To be more parsimonious and interpretable, we used the results of ordinal logistical regression.

After controlling for proficiency level, demographics, and inmates' desire to enroll in academic programs – one of the elements about which researchers constantly show concern as a selection bias for evaluating the effectiveness of prison-based educational programs (Wilson, Gallagher, & Mackenzie, 2000; Wilson, Bouffard, & Mackenzie, 2005), we found a very robust result. As shown in Table 8, for inmates who participate in vocational training, the ordinal log odds of increasing one literacy skill used in prison life is 0.87 greater than for non-participants when the other variables in the model are held constant. Likewise, the ordinal log odds for inmate participants in vocational training using one more numeracy skill in prison is 0.52 greater

than their peers who did not participate in vocational training when the other variables in the model are held constant. This positive relationship between participation in vocational programs and skills use is important. Since most inmates will eventually be released and reintegrate into society, it is critical to invest in programs that not only directly teach inmates skills but also support their activities involving the use of literacy and numeracy skills in everyday life. This support plays an important role in enhancing and maintaining the skills inmates need for post-release employment.

Conclusions

The population that participates in correctional education is unique. Our findings present a picture of contrasts and convergences. One contrast is low education level versus high demand for learning. Approximately one third of the inmates in the PIAAC U.S. prison survey did not graduate from high school and nearly two thirds only hold high school diploma; 94 out of 100 inmates do not have any college degree (including associate degrees). Yet, over 70 percent of the inmates wanted to enroll in an academic program during their incarceration. Most of the inmates participating in academic and vocational programs list increasing employability and improving oneself as their main reason to participate in correctional education.

The second contrast we found is the low use of literacy and numeracy skills at prison jobs versus the high requirement of using more literacy and numeracy skills at work outside prison. Although 70 percent of the inmates in the PIAAC prison survey have reached the basic literacy level (Level 2) and 80 percent of the inmates reported that they often read books in everyday life during incarceration, we cannot conclude that their reading is enough to prepare them for the literacy skills needed for postrelease employment. As for numeracy, 52 percent of the inmates did not reach the basic numeracy level (Level 2). In other words, they cannot identify or act on

mathematical information or ideas embedded in a range of common contexts where mathematical content is, however, ubiquitous in their postrelease life, and explicit or visual (Rampey et al., 2016).

According to the American Institutes for Research (AIR, 2015), numeracy is a critical skill to succeed in higher education and the workforce. Although our study does not lead to a conclusion that low numeracy level is a main obstacle for inmates to continue postsecondary degree program or vocational training, we found that the inmates who participated in vocational training did have higher numeracy (Level 2 or above Level 2) and reported using more numeracy skills in their daily life in prison. Future research should examine factors that affect how inmates acquire and maintain numeracy skills.

As for the convergences, we found that the current setup of academic and vocational programs does correspond to inmates' proficiency levels, and inmates do participate in such programs to obtain a higher proficiency level. The 2014 PIAAC U.S. prison data show that, on average, inmates who participated in basic skills and GED programs have low, basic proficiency level, and the completion of a higher education level (most likely high school diploma) provides inmates with the foundational literacy and numeracy to move forward to postsecondary degree programs or vocational training. Inmates who participate in vocational programs, in general, have much higher numeracy proficiency levels.

Vocational programs should garner more attention and investment for their contribution to post-release employment. In the PIAAC data, inmates who participated in vocational programs demonstrated higher literacy and numeracy, developed some job skills, and most important of all, used more cognitive skills in their everyday life during incarceration. However, approximately 40 percent of the non-participants reported that non-eligibility or lack of

educational qualifications hamper their participation in vocational training. Our analysis is limited to detecting some signals and it is not deep enough to answer questions such as whether there are access or availability issues related to vocational programs. We suggest that future research should further consider this topic and conduct a profound investigation of it.

Lastly, “[s]kills are only of value when they are used – whether in the labor market or in other non-market settings, such as voluntary work, home production or even in leisure activities” (OECD, 2013, p. 36). For any program, there is a start point and end point, but learning skills and using acquired skills should go beyond participation in one or more programs. Inmates with low literacy and numeracy not only need to participate in academic programs but also need to continue learning even after being released.

Policy Implications

Both previous and current administrations have shown a strong desire to fix the high rate of incarceration in the United States. The underpinning belief is that correctional education can reduce recidivism and improve the chances of post-release employment. To this end, we recommend that policy makers consider the positive relationship we found between skills use and participation in vocational programs when making decisions on budgeting correctional education.

In addition, identifying the type, amount and intensity of evidence-based recidivism reduction programs becomes, accordingly, an urgent call. Our study, using PIAAC U.S. Prison data, identified three types of prison-based programs that serve inmates who possess a range of literacy and numeracy levels. Programs targeting basic skills serve inmates without a GED or high school diplomas; programs that help to obtain a GED or high school diplomas equip inmates with necessary literacy/numeracy proficiency levels so they can pursue appropriate job

training programs or postsecondary education. The third type of program is vocational or professional training that fosters advanced learning in areas such as computer, mechanics and technology.

After the release of the first report on PIAAC U.S. Prison study (Rampey et al., 2016), the U.S. Department of Education immediately called for more high-quality education programs in correctional facilities and emphasized the importance of integrating employability skills into the curriculum (U.S. Department of Education, 2016). From the perspective of need-based education, increasing the amount and intensity of programs targeting basic skills is a must, as almost one in three inmates have education levels lower than high school. However, it should be noted that almost two in three inmates hold a GED or high school diploma. From the perspective of high-quality education, vocational and professional training programs should receive more attention from policy makers, for these programs lead to the ability to not only obtain but also retain employment which is key to reducing recidivism.

More than two decades ago, the National Center for Education Statistics (NCES, 1994) reported that, “Inmates having a high school diploma should not be viewed as necessarily possessing the literacy skills needed to function in society, given that their performance is lower than that of householders with a high school diploma” (p. xxii). While we did not look into this difference, we found a huge gap in literacy and particularly numeracy proficiency between inmates and those living in households. A large proportion of inmates have low literacy/numeracy proficiency levels, which is a large disadvantage for their reentry into the work force. An even more worrying situation is that inmates use far fewer numeracy and literacy skills than householders in both work and everyday life. This is more likely to cause inmates to lose the skills they acquired prior to incarceration. We recommend more opportunities be created

to improve inmates' literacy/numeracy skills beyond instructional hours, and provide avenues to increase the use of the skills they already have, in prison jobs and activities. This way, inmates can be more prepared to reenter society.

Compared with the adult education available to the household population, correctional education faces a number of limitations in terms of diversified learning approaches. We found that most of the academic course delivery (i.e., venues) for inmates is still the traditional, face-to-face classroom teaching within correctional facilities. Although close to half of inmates participants in vocational programs take training off the correctional sites, lack of student-centered and individualized online learning programs is still the reality. Therefore, we recommend funding more feasible educational technology – disconnected Internet, point-to-point, and restricted access – as suggested by the Reentry Education Framework supported by the U.S. Department of Education (2016). This approach may resolve some issues related to capacity, length, and level of the programs.

Limitations and Future Study

There are some limitations in our study. In the last analysis (Table 8), when holding other variables constant, we found that Black inmates were more likely to use a larger number of literacy skills than White inmates, and Hispanic inmates were more likely to use fewer numeracy skills than White inmates. However, we did not discuss these results because of sampling errors. We recommend that future research be conducted on those demographic factors, which may help identify possible differences in the use of cognitive skills through the lens of culture and ethnicity.

Another limitation of our study lies in our outcome variables, which were not direct achievement scores of prison-based programs, post-release employment, or recidivism. Although

according to literature, inmates' participation in programs and their literacy/numeracy proficiency are relevant to post-release situation, the results of our study cannot be used to assess program effectiveness or predict inmates' post-release employment or recidivism. As we mentioned at the beginning of this article, we cannot draw definitive conclusions about which programs work, as the PIAAC U.S. Prison data are not longitudinal and it is not possible for us to compare between inmates' literacy/numeracy levels at the start and completion of a program. We strongly suggest using longitudinal data and PIAAC skills measure for future studies of prison-based academic and vocational programs.

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