BEHAVIORAL IMPLICATIONS OF PARTICIPATION IN A MUNICIPAL SOLID WASTE MANAGEMENT PROGRAM GUIDED BY PARTICIPATORY LEARNING WITHIN A MEDIUM-SECURITY CORRECTIONAL INSTITUTION

by

Hannah S. Rogers

An Abstract
presented in partial fulfillment
of the requirements for the degree of
Master of Arts
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ABSTRACT

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Sustainability practices such as municipal solid waste management have the potential to improve behavior of incarcerated individuals who participate, decrease correctional institution operating costs, and reduce negative environmental impacts. The first objective was to assess behavioral implications of participation in a municipal solid waste management program guided by participatory learning. The second objective was to identify the most efficient arrangement of composting practices to the correctional institution. There was a significant difference between the number of misconduct violations before and after participation of participants who completed the program, a 52.5% reduction in misconduct violations, and a 47.6% reduction in their severity. There was no significant difference between the number of misconduct violations before and after participation of individuals who did not complete the program. However, there was a 23.5% reduction in misconduct violations and a 34.1% reduction in their severity. Data from the composting practices were not obtained or analyzed.

Key words: Incarcerated individuals; Environmental education; Municipal solid waste management; Composting; *Eisenia fetida*; Participatory learning

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CHAPTER 1
INTRODUCTION

The United States has over 1.5 million individuals incarcerated in state and federal adult institutions (Carson, 2014), and the most recent Bureau of Justice Statistics' reports show recidivism rates rising. In a 1983 study observing 108,580 individuals, 62.5% were rearrested within three years (Beck & Shipley, 1990). By 1994, 67.5% of 272,111 individuals released from state institutions were re-incarcerated within a three year period (Langan & Levin, 2002). In the latest study conducted in 2005, individuals released from state institutions in 30 states were monitored and 67.8% returned within three years. After five years, that percentage rose to 76.6% (Bureau of Justice Statistics, 2014). Human behavior, including recidivism, is complex, but a fair amount of research has been performed to identify specific criminogenic needs, or factors associated with reoffending.

While there is not a one-size-fits-all predictor of continued criminogenic behavior and recidivism, attributes can include antisocial attitudes, values and beliefs; weak problem-solving and social skills; and low levels of vocational and educational skills (Gendreau & Andrews 1990). Weaker predictors are often intellectual functioning and personal distress factors (Gendreau, Little & Goggin, 1996). Matejkowski, Drain, Solomon, & Mark (2011) suggest that lack of employment, limited recreational activities, and antisocial personalities are risk factors. Mental illness—which affects 16% of adult correctional institution populations, in comparison to only 5% of the United States' general population (Ditton, 1999)—also leads to initial and ongoing deviant behavior (Bureau of Justice Statistics, 2006a; Matejkowski et al., 2011). With at least 95% of the correctional population scheduled for release, (Hughes & Wilson, 2003),

predictors of continued criminogenic behavior and recidivism need to be addressed during the incarceration period with institutional programs.

Successful programming practices target criminogenic risk factors, incorporate social-learning and responsivity methods, and have therapeutic integrity (Gornik, 2002). This risk, needs and responsivity approach, combined with active program participation, is the most effective at reducing continued criminogenic behavior and recidivism (Council of State Governments Justice Center, 2015). Additionally, preventing low risk cases from exacerbating and addressing high risk cases with behavioral, cognitive-behavioral and social learning programming is most successful (Andrews, 1989). Some of the specific institutional rehabilitation programs that have been most efficient are academic and vocational education (MacKenzie, 2006). In terms of needs, psychological, emotional and spiritual considerations are also essential (Wilson, 1984; Katcher and Beck, 1987; Friedmann and Thomas, 1995; Roszak et al., 1995; Frumkin, 2001; Wilson, 2001). Addressing individual health in an effort to target criminogenic behaviors without considering environmental factors within the correctional institutions may limit the effectiveness of the programs. For example, institutional rehabilitation programs that include environmental sustainability practices have the potential to integrate many effective program components into one—academic education, vocational experience, and could possibly even have positive moral and cognitive-behavioral effects on participants.

This combination could aid in the challenging shift from institution to society by improving academic self-esteem, exposing participants to highly sought professional skills, and improving overall well-being. The correctional institutions that have adopted similar practices have noted both the tangible and intangible benefits of improving environmental awareness and knowledge and fostering green job training (The Evergreen State College, 2012).

Additionally, participatory learning has demonstrated the ability to target successful programming practices, such as social-learning and responsivity methods, to help individuals become more aware, responsible, social, and supportive (The International Institute for Environment and Development, 2013). Program practices that reduce continued criminogenic behavior include addressing criminogenic risk factors, incorporating social-learning and responsivity methods, and maintaining therapeutic integrity (Gornik, 2002). Risk factors such as antisocial attitudes, weak problem-solving and social skills, low levels of vocational and educational skills, intellectual functioning, personal distress factors, lack of employment, limited recreational activities, and mental illness can be addressed in environmental sustainability programs with participatory learning, hands-on activities, vocational training in green job skills, and access to the natural environment and living organisms. Involvement in the programs can also save correctional institutions and communities money.

The United States spends between $25.8 and $28.4 billion per year on prisons alone (Kyckelhahn, 2013), but many environmental sustainability practices have shown to dramatically reduce institutional operating costs (Vanneste, 2010; National Institute of Corrections, 2011; Ohio Department of Corrections, 2013; Oregon Department of Corrections, 2013). Municipal solid waste management, for example, can be initiated and operated at low or no cost to the correctional institution and can save institutional funds by simple food diversion procedures. In addition to the financial advantages of diverting food waste from the garbage, institutions can also use the final product of municipal solid waste management practices—compost—in a variety of ways including fertilizer for horticulture and agricultural practices. These practices can have a positive impact on the natural environment, as well.

The natural environment is susceptible to pollution and other forms of degradation from improper disposal of municipal solid waste, and United States' correctional institutions expend a great deal resources in the form of food consumption and disposal. Many institutions eliminate food waste by sending it through garbage disposals, which is then discarded in water treatment facilities. The garbage disposal waste adds to sludge to water treatment facilities, which requires the use of additional chemicals, more, energy and labor (Washington State University, 2013). Other institutions dispose of their food waste in the garbage, which is then sent to local landfills. Food waste in landfills generate the greenhouse gas, methane—a gas 23 times more destructive to our atmosphere than carbon dioxide. In fact, 34% of all methane emissions in the United States are from landfills (Environmental Protection Agency, 2007). Diverting food waste from water treatment facilities and the garbage can reduce institutional carbon footprints for the benefit of the natural environment.

Current Research

In an effort to expand the multifaceted benefits to a medium-security correctional institution and observe the behavioral implications of participation in similar sustainability practices, two municipal solid waste programs were created and administered that allowed participants to plan and conduct hands-on scientific investigations on a weekly basis. Participants were encouraged to work as a group, bring outside experiences and skill sets into the program, ask questions, observe, make predictions, describe and classify biological processes, take responsibility for the care of living organisms, and gather and record data accurately. The programs were guided by participatory learning and emphasized pluralistic ways of thinking, learning, and acting to foster success within the program, as well as to build essential technical and behavioral skills for reentry into society. The objective was to identify and assess behavioral

implications of participation in the program by observing the number and severity of institutional misconduct violations. Specifically, it was to determine whether the program affected behavior after participation and completion.

In addition to the classroom lectures and discussions, the participants experimented with two different types of municipal solid waste management practices: vermicomposting and thermophilic composting. The objective was to identify the most efficient arrangement, in terms of decomposition, of waste management practices within the correctional institution—vermicomposting followed by thermophilic composting or thermophilic composting followed by vermicomposting. The most efficient arrangement was not statistically analyzed. Instead, only behavioral implications were analyzed with a log-liklihood goodness of fit test to determine if any significant differences existed between behavior before and after participation in the municipal solid waste management program. The data were also adjusted for severity of infractions and analyzed for percentage differences before and after both program participation and completion. These practices can address many current issues facing correctional institutions, including recidivism.

CHAPTER 2
REVIEW OF LITERATURE

Since the 1980s, recidivism rates in the United States have been increasing (Beck & Shipley, 1990; Langan & Levin, 2002; Bureau of Justice Statistics, 2014). Risk factors for criminogenic behavior include low levels of vocational and educational skills (Gendreau & Andrews 1990), lack of employment, limited recreational activities (Matejkowski, Drain, Solomon, & Mark, 2011), and a disproportionate amount of incarcerated individuals with a serious mental illness (Bureau of Justice Statistics, 2006a; Matejkowski et al., 2011). Institutional programs that have shown to reduce recidivism address the main criminogenic risk factors with social learning and have therapeutic integrity (Gornik, 2002). These include academic and vocational education (MacKenzie, 2006), as well as programs that take into consideration psychological, emotional and spiritual considerations (Wilson, 1984; Katcher and Beck, 1987; Friedmann and Thomas, 1995; Roszak et al., 1995; Frumkin, 2001; Wilson, 2001). However, programs addressing only one concern—education, vocation, or mental health—often miss the more inclusive individual benefits of a combination of the three.

Upon release, individuals often face an overwhelming amount of challenges including finding educational and employment opportunities. When institutional programs only address one of these, it can have adverse effects on reentry into the community. Even when educational programs are offered, between 60 and 70% of individuals released from correctional institutions still have difficulty finding employment within the first year (Petersilia, 2003; Travis, 2005). The same can be said of the reverse—vocational training without educational opportunities. Academics foster curiosity and build self-esteem—what many incarcerated individuals are deficient in—and curiosity and self-esteem propel academic achievement (Marsh and Yeung,

1997; Filozof et al., 1998; Hay et al., 1998). In turn, higher self-esteem can lead to increased job satisfaction (Judge et al., 2000). Andrews (1995) maintains that all criminogenic needs must be addressed in rehabilitative programming. Incarcerated individuals disproportionately have mental, substance abuse, learning, and illiteracy disabilities (Malik-Kane & Visher, 2008), and without adequate attention to each, successful reintegration into society is impaired (Young, 2014). If institutional programming couples academic with vocational training, individuals could be better prepared and society more receptive to their reentry back into the community.

A municipal solid waste management program can provide both educational and vocational opportunities. In addition, if it aims to foster a connection with the natural environment, it can also provide the inclusive individual benefits from combining all three successful program components. Municipal solid waste consists of both residential and community refuse—from household garbage to commercial trash; it excludes industrial, hazardous, and construction waste (Environmental Protection Agency, 2016). Paper and cardboard, yard clippings, and food waste are the greatest contributors to municipal solid waste. Management of municipal solid waste involves three approaches: recycling, including composting, landfills, and combustion for energy. Recycling waste with composting can provide job opportunities for individuals, have significant economic impacts in communities, and reduce greenhouse gas emissions in the natural environment (Environmental Protection Agency, 2012). The same methods can be applied in correctional institutions for the benefit of the incarcerated individuals, the correctional institution and community, and the natural environment.

Far fewer studies have been conducted in correctional institution settings than in other environments, but the results suggest multifaceted benefits expanding from the individuals themselves to the natural environment as a whole. Research supports the positive mental health,

emotional wellbeing, and behavioral impacts on incarcerated individuals from exposure to the natural environment, including engagement in environmental sustainability programs (Burns, 2005; Grinde & Patil, 2009; Kuo & Sullivan, 2001; and Weinstein, Przybylski, & Ryan, 2009). Participation in similar programs allows incarcerated individuals the opportunity to gain relevant, 'green' job skills and has been linked to decreased recidivism rates (National Institute of Corrections, 2011). Many sustainability programs also reduce correctional institution operating costs (Simas, 2013; LeRoy, Trivett, Bush, Vanneste, & Pacholke, 2013). In addition, sustainability efforts can contribute significantly to reducing some of the most detrimental anthropogenic impacts on the natural environment.

Municipal Solid Waste Management

Current institutional programming has little effect on institutional behavior and recidivism because many of the classes offered do not address the complex variation in individual needs, including education, vocation, and overall well-being. Anywhere from 60-80% of individuals are returning to correctional institution within 3-5 years of release (Bureau of Justice Statistics, 2014). Correctional institutions are designed around deprivation of liberty and incarcerated individuals' lives are completely supervised and regulated. Individuals are denied privacy and autonomy, including control over their choice of cellmates, meals, schedules, and so forth (Haney, 2001). Extended incarceration periods under such conditions can be mentally harmful depending on the individual, duration, and specific conditions. Incarceration conditions can exacerbate anxiety, depression and anger; intensify cognitive disturbances and distortions; and aggravate obsessive thoughts, paranoia and psychosis (Metzner & Dvoskin, 2006). Correctional institutions are often harsh environments, but even more so for those who are vulnerable and suffer from a mental illness.

Over 16% of individuals incarcerated in prisons and jail have a serious mental illness compared to only 5% of the United States general population (Bureau of Justice Assistance, 2011). In 2006, the Bureau of Justice Statistics estimated that 78,800 mentally ill adults were incarcerated in federal prisons, 705,600 in state prisons, and 479,900 in local jails—totaling 1,264,300 individuals with some sort of mental illness (National Institute of Corrections, 2012). Although the landmark case of *Estelle v Gamble* (1976) established basic medical rights for incarcerated individuals, and *Bowring v Godwin* (1990) expanded medical rights to include mental health treatment for serious psychiatric and psychological conditions, the World Health Organization attributes the disproportionately high rate of mental illnesses in correctional institutions in part to insufficient mental health services and ineffective treatment and rehabilitation. In addition, many mental illnesses may be intensified by the stresses of imprisonment, and some conditions may even develop as a consequence of incarceration conditions (World Health Organization, 2005). Unfortunately, correctional institutions do not always effectively identify, classify, or treat mental illnesses.

Although an estimated 60% of individuals with a mental illness in adult correctional institutions receive some form of mental health treatment, either prescriptions, therapy or participation in a specific treatment program, they are the most likely to reoffend (Baillargeon, Binswanger, Penn, Williams & Murray, 2009), including for violent offenses (Ditton, 1999). In a 1999 study of the mentally ill, out of the individuals released from state institutions, 53% were reconvicted of a violent offense in comparison to only 45% of the general population without a mental illness. In federal institutions, they were twice as likely with 44% as other incarcerated individuals at 22% (Ditton, 1999). The most common forms of correctional treatments for mental illnesses are therapy/counseling (84%) and psychotropic medications (83%). Approximately

1.8% of state institutions do not provide any form of mental health care (Beck & Maruschak, 2001), even with the estimated 16% of incarcerated individuals currently suffering from a serious condition.

There is often a deficiency in the continuity of care for individuals with a mental illness within correctional institutions (Steadman, Morris & Dennis, 1995), but participatory learning actively seeks out those individuals who need to be involved and incorporates opinions that may not normally be heard into decisions. This is especially important in institutional programming that traditionally excludes input from incarcerated individuals. Participatory learning encourages individuals to become more acutely aware of situations, understand their aspirations, take more responsibility for achieving the goals they set, nurture social relations, and build trust and support for each other (The International Institute for Environment and Development, 2013). This approach emphasizes working through experiences together with individuals from different backgrounds in an effort to incorporate a variety of unique skill sets. It is built upon collective and collaborative learning processes that seek multiple perspectives on problem situations, and continual learning about changing conditions that involve individuals in all stages of projects—essentially, a shift from passive to interactive participation (Pretty, 1995). When a municipal solid waste management program is administered using participatory learning there is potential for an interactive form of engagement, and individuals can work through experiences together to solve problems—further developing the cognitive and social tools needed to maximize the benefits of the program.

In addition, there are several theories that support the mental health, emotional wellbeing, and behavioral benefits of fostering interactions with greener, more natural environments in comparison to urban settings lacking exposure to flora and fauna. The psycho-evolutionary stress

reduction theory proposes that natural stimuli trigger psychological responses that interpret scenes of nature as places of safety resulting in positive emotional reactions (Ulrich, 1983). In 1984, Edward O. Wilson proposed the biophilia hypothesis asserting that humans have a natural instinct and desire to connect with nature, and that human identity and personal fulfillments are even dependent on the relationships (Wilson, 1984). Similarly, the attention restoration theory suggests that individuals are able to recover from attention fatigue, or the inability to focus from overusing existing attentional mechanisms, by connecting with nature. Simple visual stimulus even has a restorative effect by enabling individuals to distance themselves from routine thoughts and focus attention in a way that requires less effort. Accordingly, contact with natural environments slow overloaded brain functions, and the slowing allows the brain to restore itself (Kaplan & Kaplan, 1989). Studies conducted in a variety of environments have stemmed from the theories.

Many authors agree that natural landscapes are intrinsically satisfying, evoke contentment, and can relieve stress (Fredrickson & Anderson, 1999; McAndrew, 1993). Frances E. Kuo (2001) noted a link between poverty, anxiety, and depression after observing the effects of nature on those living in poverty. The author concluded that nature has a rejuvenating quality in reducing mental fatigue and enhances the ability of individuals to manage stress more efficiently. A comparable study observed the association between nature deficient environments and aggressive behavior in single parents. The authors found that residents living in barren buildings were more aggressive and violent than residents in buildings surrounded by more vegetated environments (Kuo & Sullivan, 2001a). A follow-up study documented how residents living in “greener” areas also reported lower levels of fear, fewer incivilities, and less aggressive and violent behavior (Kuo & Sullivan, 2001b). George W. Burns (2005) explained that in

comparison to urban environments, natural environments have softer, more pleasing stimuli. As a result, it is difficult to be depressed while interacting with a natural stimulus. He concluded that that mental benefits gained from interactions with nature are found at the cognitive, affective, and behavioral levels (Burns, 2005). Similar result can be found in correctional institutions.

Although limited studies observing the effects of contact with the natural environment have been conducted in correctional institutions, the little work that has been carried out suggests that even views of nature are associated with lower frequencies of incarcerated individual stress symptoms, including digestive illnesses and headaches (Moore, 1981-1982). For example, the Institute for Applied Ecology and the Oregon State Correctional Institution have an established greenhouse maintained by a group of incarcerated individuals who note the therapeutic value of nurturing plants during their period of incarceration (Oregon Department of Corrections, 2012). The Evergreen State College and Washington Department of Corrections initiated municipal solid waste management practices, including composting, and noted the therapeutic value of doing so within their correctional institution operations (LeRoy, Trivett, Bush, Vanneste, & Pacholke, 2013). In addition, the correctional institutions that have participated in similar sustainability practices have seen a decrease in recidivism rates, as well.

According to the co-director of the Sustainability in Prisons Project, of 238 incarcerated individuals who attended even a one conservation lecture and were later released, only two returned to prison within a year — a recidivism rate of only 0.8%. Similarly, of the 78 individuals who took part in actual conservation work, 18 have been released, none have re-offended and one-third are employed (The Evergreen State College, 2012). Other state departments have also observed lowered recidivism rates as a result of their sustainability practices. The New York Department of Corrections partners with the Horticultural Society of

New York to provide horticulture training and therapy to inmates through the Green House Program, including post-incarceration employment through its sister program, the Green Team. A recent study by the New York State Division of Criminal Justice shows that out of 500 graduates from the programs, only 10% were reconvicted in the first year, compared to 21.5% of the population who did not participate in the program. Furthermore, after three years only 25% reoffended—down from 47% of the general population (National Institute of Corrections, 2011). The impacts of reduced recidivism reach further than the individual.

Recidivism also burdens social costs to families (Hagan & Dinovitzer, 1999), public safety costs to communities (Hagan & Dinovitzer, 1999), and financial costs to society from arresting, prosecuting, and incarcerating re-offenders (Langan & Levin, 2002). For example, 67.5% of a population of 300,000 individuals released in 1994 were rearrested within 3 years and accumulated $744,000 in rearrest, prosecution, and incarceration charges (Langan & Levin). The Urban Institute estimate that each day re-incarceration is avoided could save society roughly $268 ($105 in criminal justice system costs and $163 in victimization costs) (Urban Institute, Justice Policy Center, 2013). The benefits of participation in an environmental sustainability program can also be observed at the institution level.

Not only does fostering a connection with the natural environment have the potential to positively affect health, wellbeing and behavior, many practices can be initiated and operated at low or no cost, and even reduce institutional operating expenditures. The National Institute of Corrections outlines ways correctional institutions can be more environmentally sustainable, one of which is composting institutional waste (National Institute of Corrections, 2011). Many composting practices can be initiated at low or no cost to the correctional institutions, with minimal staff effort, including vermicomposting and thermophilic composting (Vanneste, 2010;

National Institute of Corrections, 2011; Ohio Department of Corrections, 2013; Oregon Department of Corrections, 2013); in turn, they can alleviate associated budget and staff constraints. Furthermore, cooperative relationships with researchers and universities can provide the necessary expertise for program and practice initiation and training (Vanneste, 2010; National Institute of Corrections, 2011; Ohio Department of Corrections, 2013; Oregon Department of Corrections, 2013). The few state departments that have realized these benefits have teamed together to form partnerships between environmental specialists and correctional professionals.

The Evergreen State College in Olympia, Washington began initiating a series of environmentally sustainable practices and programs at the Cedar Creek Corrections Center in 2004, and many showed tremendous cost-cutting benefits. From 2005 to 2010, the Department reduced solid waste by 35%, increased food waste diversion to composting operations by 90%, and saved over $260,000 as a result (Vanneste, 2010). By 2013, nine of the Department of Correction's twelve institutions had established inmate-maintained waste management programs consisting of both thermophilic composting and vermicomposting (Mendrey, 2013). The Department reports that one correctional institution alone saves on average $60,000 each year just by diverting its food waste from the local landfill (Vanneste, 2010). Similarly, the South Carolina Department of Corrections partnered with state conservation agencies and diverted 50% of institutional solid waste from landfills between 1991 and 2004. By 2009, their savings averaged $540,042 annually (National Institute of Corrections, 2011). The Oregon Department of Corrections also maintains partnerships with the Sustainability in Prisons Project, the Institute for Applied Ecology, Oregon State University, the Lettuce Grow Gardner Foundation, and other conservation organizations to meet its sustainability goals—including municipal solid waste

management. As a result, the Oregon State Penitentiary saves approximately $9,600 per year in garbage fees after initiating a composting program in 2012 (Oregon Department of Corrections, 2013). The Southeastern Correctional Institution in Ohio also reported successfully reducing their trash bill from $95,000 to $5,000 in one year with expanded composting and recycling efforts (Ohio Department of Corrections, 2013). Fostering a connection with the natural environment through municipal solid waste management practices also has substantial value in environmental protection.

Of the three municipal solid waste management approaches, recycling, including composting, landfills and combustion for energy, composting is the most advantageous to the environment causing the least amount of harm. Many correctional institutions eliminate food waste by sending it through food waste processors, or garbage disposals. The waste is then filtered into water treatment facilities which require environmentally-degradative chemicals, energy, and labor. The disposals also contribute to eutrophication and utilize high amounts of water (Lundie & Peters, 2005). Other institutions discard their food waste in the garbage which is then either incinerated or transported to landfills. The Richard J. Donovan Correctional Facility in California reported that before the initiation of their composting practices they generated close to 3,000 tons of food waste per year and required trash pickup services seven days a week (Simas, 2013). Incinerating waste conserves three to five times less energy than recycling and composting (Broude, Angel, & Wilson, 2009), and landfills significantly contribute to global warming with their methane emissions. Landfills can also contaminate soil and groundwater with leaked leachate (Belk et al., 1994). A municipal solid waste management program comprised of two different composting practices could overcome these limitations with evidence-based practices and research implications.

For example, vermicomposting has the potential to provide a wealth of benefits from horticultural and agricultural fertilizer to cost reductions in waste management services. Earthworms consume organic waste but only absorb 5-10%; the rest of the material is excreted in the form of nitrate, phosphate and potassium-rich accumulations called vermicastings which are ideal for fertilizer. Furthermore, the process is odor-free due to earthworm fluids that kill pathogens (Pierre, Phillip, Margnerite , & Pierrette, 1982). Earthworm activities enhance natural biodegradation and decomposition of wastes anywhere from 60-80%, and can degrade most organic wastes by 80-100% within 6-8 weeks (Hand, Hayes, Frankland, & Satchell, 1988). However, specific barriers to vermicomposting often involve small populations of earthworms used in vermicomposting insufficiently composting large amounts of correctional institution food waste. This necessitates a larger vermicomposting system or the initiation of a combination of composting practices to address excess waste. Another barrier with vermicomposting, due to the temperature requirements of earthworms, is that the system is unable to reach temperatures high enough to destroy pathogens in highly susceptible wastes such as food. For example, *Eisenia fetida*, a common species used in vermicomposting practices, are most efficient at breaking down organic waste at temperatures between 21.1° C (70º F) to 26.6° C (80º F), but can withstand temperatures between 3.3° C (38° F) and 31.1° C (88° F) (Othman, Irwan, & Roslan, 2012). However, there are comparable practices that do not require temperature-tolerant organism.

Thermophillic composting does not require temperature-tolerant organisms and can reach temperatures high enough to destroy harmful pathogens (Ndegwa & Thompson, 2001). Temperatures adequate to sanitize organic waste are between 46° C (115° F) and 55° C (131° F) (Elving, Vinnera, Albihn, & Ottoson, 2014), and thermophilic composting systems can reach peak temperatures between 66° C (150.8° F) and 73° C (163.4° F) with proper management

(Mitchell, Ullman, Bary, Cogger, Teel, & Watts, 2015). Ndegwa and Thompson (2001) suggest combining techniques from both vermicomposting and thermophilic composting practices to address large amounts of waste and pathogens and achieve maximum efficiency. Therefore, the waste management program was implemented utilizing both composting practices.

In the studies that have observed the effects of implementing environmental programming in correctional institutions, few have observed a relationship between participation and recidivism, and even less have assessed institutional behavior after participation. The studies most commonly focus on qualitative therapeutic value and short-term recidivism rates. However, both long-term and short-term outcomes need to be measured—long-term recidivism and employment rates, and short-term evaluations of education scores and institutional behavior (Davis, Bozick, Steele, Saunders, & Miles, 2013). Understanding how different programs effect incarcerated individuals' institutional behavior can aid correctional professionals in their ability to adequately adhere to evidence-based practices and decision-making in institutional programming. If not addressed, the research gap in institutional behavioral outcomes could prevent correctional professionals from making informed decisions regarding institutional programming and administration. Assessing the behavioral implications of participation in a municipal solid waste management program aims to fill this gap.

CHAPTER 3
METHODOLOGY

The research was conducted in a state-run medium-security correctional institution in central United States. The institution currently employs 320 employees and houses roughly 1,336 male incarcerated individuals, typically with less than two years left on their sentences. The project was designed to assess the behavioral implications of participation in a municipal solid waste management program, as well as the efficiency of selected composting practices. A quantitative research approach was chosen to avoid participant to researcher bias and increase the opportunity for objective reproducibility (Mays & Pope, 1995). In an effort to retain certain qualitative benefits, such as individualization, the groups of participants were limited in size (Carr, 1994). The behavioral implications assessment was carried out to completion and analyzed as anticipated; however, the waste management program assessment was compromised and data were not analyzed on the efficiency of the two selected composting practices. The practices were still carried out as closely to design as possible and remain a component of the project due to their importance, with or without accompanying efficiency results. The significance, details, and limitations of the research design are discussed in the following.

Behavioral Implications Assessment

Participation in the program was voluntary and individuals were only eligible if they 1) were over the age of eighteen, 2) had at least one documented institutional infraction during their current incarceration period prior to participation in the program, 3) had a minimum of nine months remaining on their sentence at the onset of the program, and 4) possessed the physical ability to rake, shovel, and operate a wheel barrow. These criteria were established to provide an adequate, but realistic, length of time to assess behavioral implications. The prior infractions

were also necessary to identify any behavioral changes. Ideally, participants would have at least one institutional infraction in a six month time frame before participation in the program, the 12-week classes multiplied by two would provide another six months of behavioral data, and collecting an additional six months of post-program behavioral data would allow a comparison between the three time periods—six months before, six months during, and six months after program participation.

Eligible individuals were identified by an assigned Department of Corrections' case worker from institutional records and then offered the opportunity to volunteer for the study. From the individuals who expressed interest in volunteering, a total of 40 (20 per class) were initially to be randomly selected from incarcerated individual identification numbers by a random number generator. The consent form that was utilized was intended to serve a dual purpose and not only be distributed to those who expressed interest in the study, but also to be used as a posted flyer within housing/dining units to attract a diversity of eligible individuals to the program. In spite of this directive, it was only offered to select individuals—assumed to be interested—at the discretion of Department of Corrections' staff (please see Appendix A for the full consent form). Due to this, the original 36 individuals (23 in the first class, 13 in the second class) selected were accepted into the program as opposed to the anticipated 40 participants. Originally, the study design specified that eligible participants were not to receive any institutional incentives to participate. That is, receiving "good time credit" reducing the length of their incarceration period, restorative justice hours contributing to reaching institutional objectives, or any other incentives outside of the researcher-given Certificate of Completion at the conclusion of each class. However, because of miscommunications between the researcher

and Department of Corrections' staff, individuals were offered both restorative justice hours and a Certificate of Completion from the institution without notification to the researcher.

The individuals who participated had less than two years remaining on their sentences—per the short-term, medium-security correctional institution. The participants were all male with a diverse makeup of age, race, and geographic upbringing. Due to research design and program scheduling, they were not involved in any other institutional programs outside of work assignments. The information that was provided to the researcher throughout the program duration included only first and last names of the participants and their respective work assignments. To ensure confidentiality, infraction data was provided after the program concluded by a Department of Corrections' case worker with corresponding inmate identification numbers instead of individual names.

Due to the nature of correctional institution environments, research is typically limited to studies with a valid reason for involving incarcerated individuals and concerns such as coercion must adequately be addressed. As a result, incarcerated individuals were given a written summary of the program on the first day of class prior to participation. The summary addressed how the results of the study would be used to evaluate the behavioral effects of participation in the waste management program. It was clearly emphasized that the individuals' role in the study would be completely anonymous, that questions regarding program results could be addressed to the primary researcher at any time, and that program resignation was acceptable at any time for any reason (please see Appendix A for the full consent form).

The program was an original curriculum designed to encompass specific elements of multi-disciplinary best practices. In the United States, recidivism and mental illnesses are two of the most prominent issues facing our justice system. Recidivism is often attributed to antisocial

attitudes, values and beliefs; weak problem-solving and social skills; and low levels of vocational and educational skills (Gendreau & Andrews 1990). Likewise, mental illnesses also contribute to initial and ongoing deviant behavior (Bureau of Justice Statistics, 2006a; Matejkowski et al., 2011). As a result, the curriculum focused on participatory learning to build social and problem-solving skills. It also addresses relevant, desired vocational and educational skills to expand post-release opportunities for participants. This approach is used in both educational (Domínguez, 2012) and environmental (Johnson et al., 2012; International Institute for Environmental Development, 2016; Pretty, 1995) best management practices.

A municipal solid waste management concentration was chosen because of its benefits to individual health, correctional institution expenditures, and the natural environmental. Exposure to the natural environment has been to shown to improve individual health and mental well-being (Burns, 2005; Fredrickson & Anderson, 1999; Kuo & Sullivan, 2001a; Kuo & Sullivan, 2001b; McAndrew, 1993; Moore, 1981-1982), including in the form of waste management practices (LeRoy, Trivett, Bush, Vanneste, & Pacholke, 2013). Many waste management practices can also reduce operating costs (Vanneste, 2010; National Institute of Corrections, 2011; Ohio Department of Corrections, 2013; Oregon Department of Corrections, 2013). Proper disposal of municipal solid waste is imperative to environmental health and experts agree that composting is the best management practice (Environmental Protection Agency, 2012). As a result, program objectives, participant learning objectives, and course content emphasized participatory learning while carrying out two different municipal solid waste management practices throughout the program.

Two, back-to-back 12 week programs were administered. The primary researcher met with participants twice weekly for two hours each day—totaling a 48 hour program. The first day

of the week was originally reserved for in-class education, observation and planning, and the second day for hands-on learning. As the classes progressed, the participants were given the opportunity to provide input and personal experience to each lesson, as suggested by the participatory learning literature. The primary objective of the program was to introduce participants to various waste management practices and expose them to planning, constructing, maintaining, and analyzing both traditional composting and vermicomposting systems. To meet these objectives, participants planned and conducted hands-on scientific investigations on a weekly basis. They were also encouraged to work as a group, bring outside experiences and skill sets into the classroom, ask questions, observe, make predictions, describe and classify biological processes, take responsibility for the care of living organisms, and gather and record data accurately (please see Appendix B for the course syllabus).

In an effort to decrease sampling biases, each of the 36 participants served as their own control during the study. Hines et al. (1987) found that behavior correlations were higher in situations where actual behavior was assessed than in cases of self-report of behaviors. As a result, types and counts of violations were recorded 24 weeks prior to program participation, 12 weeks during program participation, and 24 weeks post program participation. In the *Offender Rulebook*, the Department of Corrections' major, or Level 1, violations are listed by severity from one to nine including murder/manslaughter, assault, dangerous contraband, escape, hostage/restraint, riot, forcible sexual misconduct, arson, and organized disobedience, respectively. The nine major violations are followed by 32 more regarded as minor, or Level 2, also listed by severity. The last nine consist of safety violation, unauthorized organizations, malingering, program failure, unauthorized relationships, abuse of telephone, mail or finance, abuse of judicial proceedings, state, federal, municipal or court law or ordinance, and procedures

and rules. Specific examples are listed under each Level 2 violation, and depending on severity, could be demoted to a Level 3 violation—the least severe offense type. Examples of Level 3 violations include possessing unauthorized amounts of property and failing to follow sign-in/sign-out procedures. It is important to note the definition of and discretion in issuance of institutional misconduct violations. A violation can range from murder to failure to sign in to a housing unit. While the more severe violations are not commonly subject to individual discretion, the lesser are and regularly depend on the correctional staff issuing the violation, as well as the individual on the receiving end. This is typically dealt with in correctional research by a large enough sample size to neutralize as much discretion as possible (Patenaude, 2004), which was not accomplished in the current study.

To effectively identify and analyze the changes in severity of behavior, each Department of Corrections' violation type, from one through 41, was given a researcher-assigned value from most to least severe. That is, Level 1, violation one—murder/manslaughter—was assigned the number 54. The numbers decreased from Level 1, to Level 2, to Level 3 offenses until the number 1 was reached with failing to follow sign-in/sign-out procedures. This method allowed for severity to be taken into account on top of counts of recorded violations, but the wide discretion in misconduct reporting should be noted. Depending on the incarcerated individual and correctional officer or other staff member, the number and severity of the violation could differ considerably. For example, an incarcerated individual late for an appointment could be issued a violation or the misconduct could be verbally addressed depending on both individuals.

Municipal Solid Waste Management Program Assessment

The municipal solid waste management program included initiating and maintaining two composting practices: vermicomposting and thermophilic composting. Municipal solid waste is

essentially any trash or garbage discarded on a regular basis—including food. Vermicomposting involves earthworms that break down organic waste. Thermophilic composting, on the other hand, relies on certain bacteria that thrive in elevated temperatures to break down the waste. Many of the materials used to construct the vermicomposting bin were donated by staff and faculty at the University of Central Missouri. At completion, the bin measured 8' x 2' x 2' and was constructed from untreated lumber. The earthworms used for vermicomposting were *Eisenia fetida*, which can process up to half their body weight in food per day (Edwards & Bohlen, 1996). For effective vermicomposting, the Missouri Department of Natural Resources suggests approximately 1,000 earthworms to every ½ pound of daily food waste (Missouri Department of Natural Resources, 2006). Accordingly, the vermicomposting bin was designed with 32 cubic feet to hold the 30,000 initial earthworms who necessitate an enclosure of 1,000 worms per cubic foot (Angima, Noack, & Noack, 2011).

As recommended by Georg (2004), the bedding for the vermicomposting bins consisted of shredded paper that was also obtained from correctional institution and university administrative offices. Similarly, materials used for the thermophilic composting bin were upcycled from the correctional institution and included four used 40" x 48" wooden pallets and pieces of scrap baling wire to secure the pallets together. Leaves and grass clipping were added to the food waste before entering the thermophilic composting bin to avoid wind dispersal of shredded paper. The paper was obtained from both Department of Corrections and University of Central Missouri administrative offices.

To determine which arrangement of composting practices was most efficient, and therefore most beneficial to the correctional institution—vermicomposting followed by thermophilic composting or thermophilic composting followed by vermicomposting—the two

groups of incarcerated individuals implemented the arrangements in reverse to one another. Thus, the first group of 23 incarcerated individuals experimented by introducing institutional food waste into a vermicomposting bin for 35 days followed by transferring the waste into a thermophilic composting bin for another 35 days to finish the composting process. In reverse, the second group of 13 incarcerated individuals introduced a set amount of institutional food waste into a thermophilic composting bin for 35 days and then transferred the waste into a vermicomposting bin for the remaining 35 days. This time frame allowed for decomposition of food waste in both groups for analysis, as well as reserved the first week of the program for introductions and familiarization with the researcher, peers, and project, and the concluding week of the program for project analyses and composting certificate distribution.

Ulrich and Nadkarni (2008) found that cutting and grinding food waste and then mixing with sawdust prior to composting procedures was the most efficient way to begin the composting process (Ulrich & Nadkarni, 2008). Therefore, both composting practices began with cutting or chopping food waste, but shredded paper was introduced instead of sawdust. Georg (2004) supports using shredded paper or cardboard. Ndegwa & Thompson (2000) found that out of carbon to nitrogen ratios of 10:1, 15:1, 20:1 and 25:1, a ratio of 25:1 resulted in the highest stability, value, and least environmental pollution of the vermicomposting end product, or vermicastings. Therefore, a carbon to nitrogen ratio of 25:1 was estimated throughout both practices with the use of the *Carbon and Nitrogen Content of Common Compost Ingredients* chart (University of California Division of Agriculture and Natural Resources, 2016). The shredded paper was initially soaked in water for 24 hours and then drained to ensure adequate moisture levels prior to adding the earthworms to the bins (Bates, 2009). The operation was carried out in cooperation with currently-staffed institutional kitchen employees. For productive

vermicomposting, the Missouri Department of Natural Resources suggests utilizing approximately 1,000 earthworms to every ½ pound of daily food waste (Missouri Department of Natural Resources, 2006). The earthworms used were *Eisenia fetida* because they can process up to half their body weight in food per day (Edwards & Bohlen, 1996), and were purchased form Uncle Jim's Worm Farm in Pennsylvania.

A total of 30 pounds, or 30,000 earthworms, were introduced to the vermicomposting bin anticipating an average of fifteen pounds of food waste at the onset of the first class. A combination of time and security constraints necessitated the initial addition of food waste to the vermicomposting bin by a group of participants and a Department of Corrections staff member. Due to miscommunications in the quantity and variety of selected food waste, 120 pounds of institutional cooked cabbage were added to the vermicomposting bin 36 hours before the researcher returned to the classroom. The excess waste resulted in an unforeseen odor and an inadequate amount of earthworms to break down the food waste before attracting other organisms, such as flies. As a result, negative attitudes from other employees aroused and the vermicomposting bin and municipal waste management program were moved from their original location. Instead of attempting to separate the earthworms from the food waste and restart with appropriate amounts—which would have furthered stressed the earthworms and interfered with the program schedule—the program progressed as planned. To mediate potential damages as much as possible, additional shredded paper was added to the vermicomposting bin to maintain the 25:1 carbon to nitrogen ratio, and the earthworms were monitored daily by the researcher and Department of Corrections' staff for signs of stress, such as congregating in one area, moving out of the enclosure, or inactivity.

The vermicomposting bin was kept inside a classroom in a secure location in the middle of the institution for the length of the program. Initially, earthworm biomass was to be measured and recorded to assess reproduction, and total solids that had not been composted were to be measured and recorded to assess productivity at the onset and completion of each 35 day period. However, due to the complications at the beginning of both programs, neither of these components of the composting practices were measured or analyzed. Temperature was taken twice weekly to maintain a steady temperature throughout and ensure a suitable environment for the earthworms.

In addition to introducing cut or chopped food and shredded paper, the contents of the thermophilic composting bin were also manually turned and mixed once a week by program participants to allow proper aeration. Similar to the vermicomposting practices, total solid particles remaining at the completion of each 35 day period were originally to be weighed and recorded to assess productivity but were not able to be measured or evaluated during the study due to institutional complications. Temperature was taken weekly to ensure the food waste passed from the mesophilic 35° C (95°F) to the thermophilic stage at 55° C (131°F), which is necessary for adequate decomposition (Kima, Ahnb, & Speecea, 2002). Vermicomposting can provide a wealth of benefits from horticultural and agricultural fertilizer to cost reductions in waste management services.

Earthworm activities enhance natural biodegradation and decomposition of wastes anywhere from 60-80%, and can degrade most organic wastes by 80-100% within 6-8 weeks, making composting practices both practical and timely for correctional institutions with large amounts of organic waste (Hand, Hayes, Frankland, & Satchell, 1988). However, thermophillic composting can reach temperatures high enough to destroy pathogens within the food waste,

whereas the vermicomposting cannot due to temperature-dependent earthworms. Ndegwa and Thompson (2001) suggest combining techniques from both vermicomposting and traditional thermophilic composting practices to address large amounts of waste with pathogens and achieve maximum efficiency.

The research aimed to assess behavioral implications of participation in a municipal solid waste management plan, as well as determine the most efficient arrangement of composting practices to the correctional institution. Behavioral data was analyzed by observing counts of misconduct violations before and after participation in the program and the severity of each count before, during, and after program participation. Essentially, there were two groups of participants—those who completed the program and those who did not. The results are also broken down further to establish if any differences in behavior occurred between the two groups. Data from the composting practices was not obtained or analyzed. The practices were still carried out to completion due to their overall importance.

CHAPTER 4
RESULTS

The project was designed to assess the behavioral implications of participation in a municipal solid waste management program, as well as the efficiency of two different arrangements of composting practices. The behavioral implications assessment was carried out to completion and analyzed as anticipated; however, the waste management program assessment was compromised and data were not analyzed on the efficiency of the two selected composting practices. The practices were still carried out as closely to design as possible and remain a component of the project due to their important environmental impact.

Behavioral Implications Assessment

A total of 36 incarcerated individuals participated in at least a portion of the municipal solid waste management program—23 in the first and 13 in the second 12-week class. Out of the 36 individuals, 21 completed the program in its entirety and 15 did not for various reasons. Of the individuals who did not complete the program, eight dropped out after an average of 6.1 classes (three weeks) and seven were sent to administrative segregation after an average of 7.8 (four weeks) classes. Therefore, there was some exposure to the program material for all 36 initial participants. The data were analyzed to compare the behavior of the group who completed the program to the behavior of the group of participants who did not. It was also assessed in a way that compared individual behavioral changes by number of misconduct violations, as well as the severity of violations, of those who completed the program and those who did not.

Initially, behavior was analyzed by comparing the difference between the number of misconduct violations six months before and six months after participation of individuals who completed the municipal solid waste management program. There was a significant difference

between the observed number of misconduct violations and the expected number of misconduct violations of program participants who did complete the municipal solid waste management program as shown in Figure 1. (Log-likelihood Goodness of Fit Test, $p<0.01$). There was also a 52.5% reduction in the number of misconduct violations from six months before to during the program and a 52.5% reduction from six months before to six months after participation in the group of individuals who completed the program.

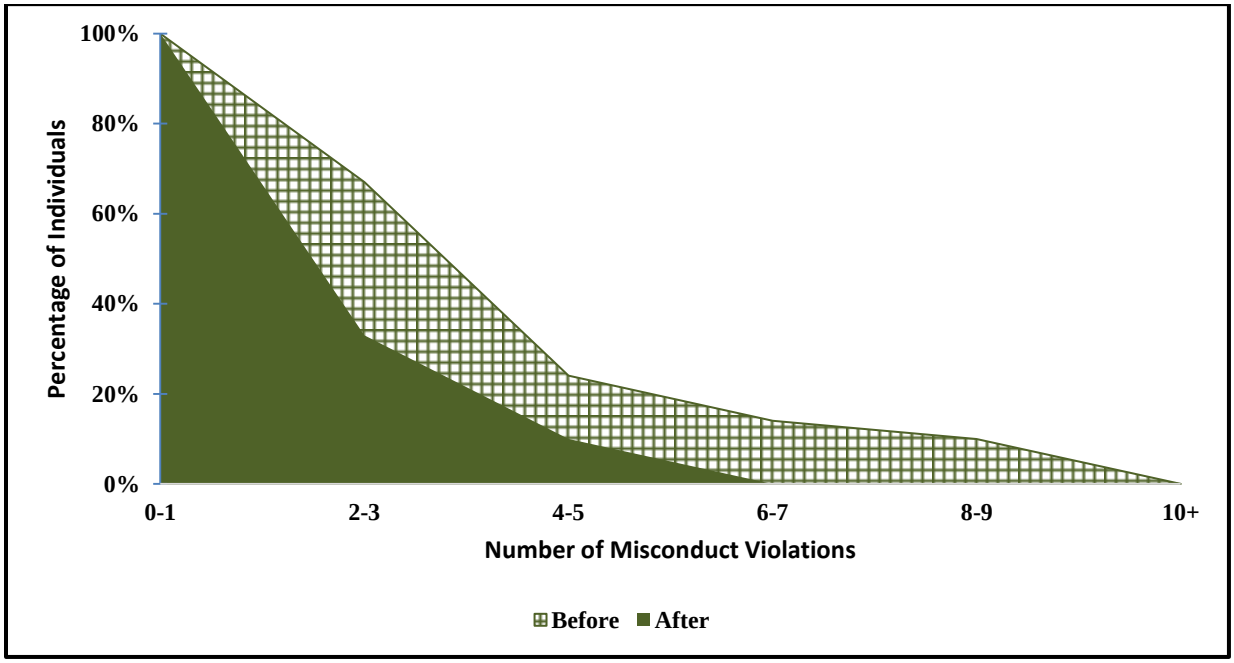

Figure 1. Differences in the number of misconduct violations six months before and six months after participation of individuals who completed the municipal solid waste management program.

Behavior was also analyzed by comparing the difference between the number of misconduct violations six months before and six months after participation of individuals who did not completed the program. There was no significant difference between the observed number of misconduct violations and the expected number of misconduct violations of program participants who did not complete the municipal solid waste management program, illustrated in

Figure 2. (Log-likelihood Goodness of Fit Test, $p>0.05$). However, there was a 29.4% reduction in the number of misconduct violations from six months before to during the program and a 23.5% reduction from six months before to six months after participation in the group of individuals who completed the program.

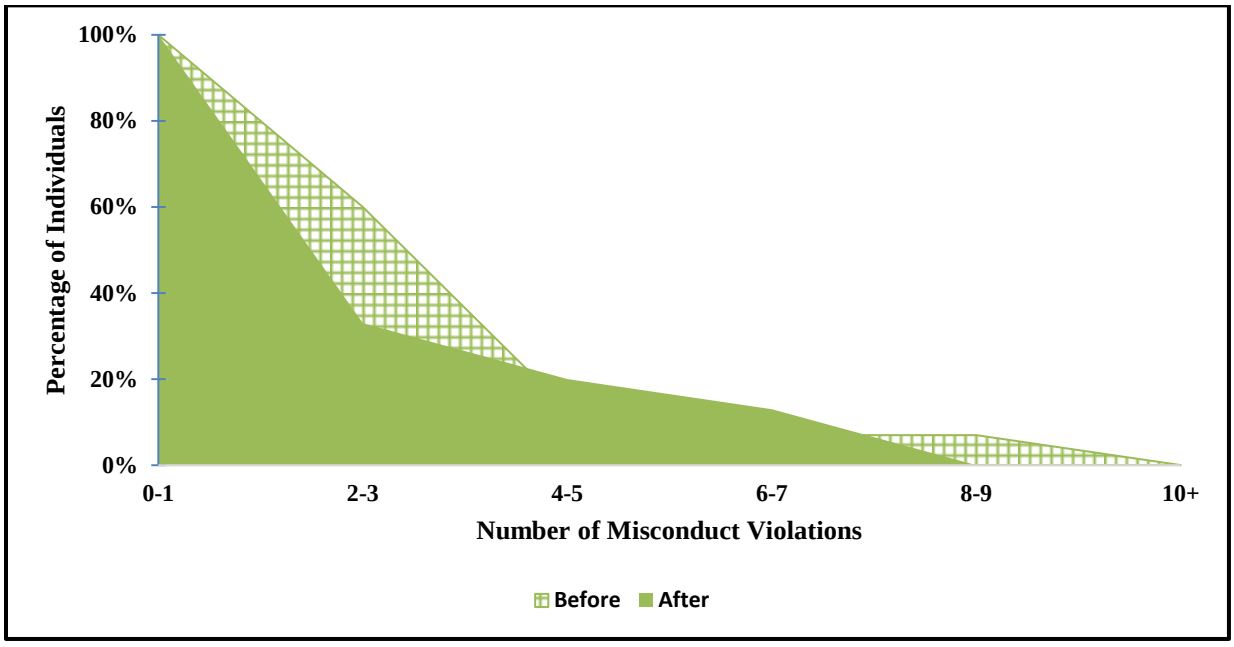

Figure 2. Differences in the number of misconduct violations six months before and six months after participation of individuals who did not complete the municipal solid waste management program.

The mean numbers of misconduct violations six months before and six months after participation were calculated for the group who completed and the group who did not complete the municipal solid waste management program. In order to also compare behavior during the three month program duration to the behavior six months before and after participation, the numbers of misconduct violations per individual were multiplied by two before calculating each group's mean to adjust for a six month time frame. That is, if an individual had a total of six misconduct violations in a three month time frame it was assumed that another six violations

would have been committed in the following three months. This allowed for an equal time comparison. The mean number of misconduct violations before, during, and after participation for both groups are shown in Figure 3.

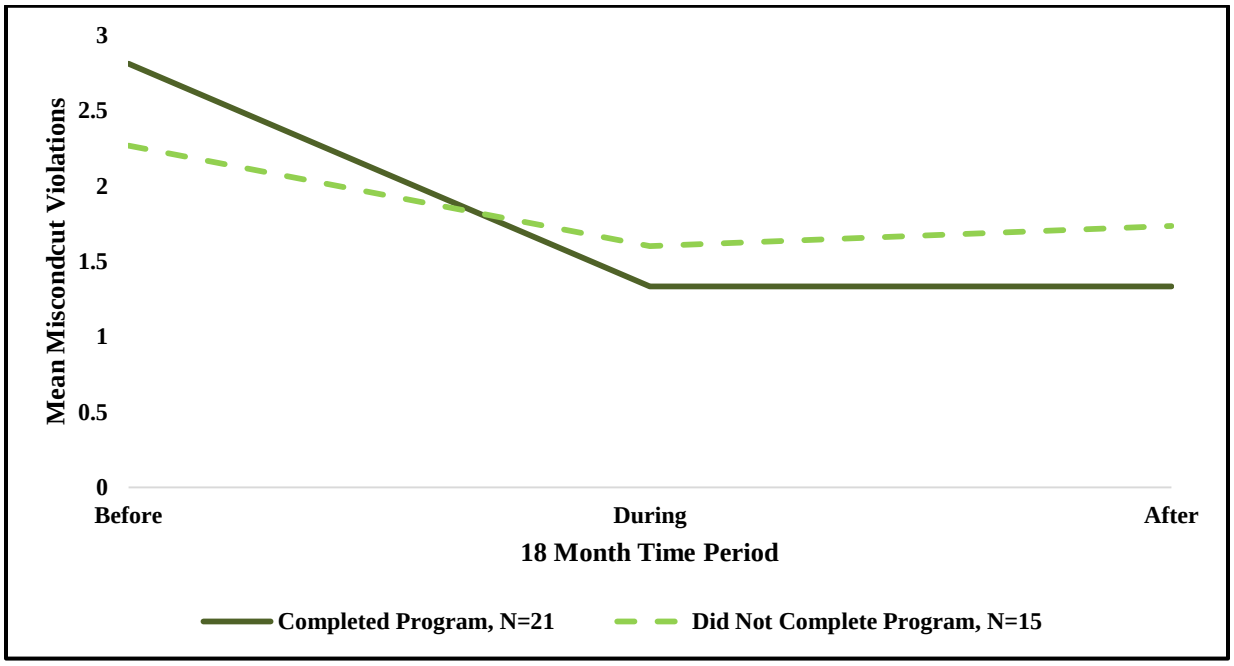

Figure 3. Mean number of misconduct violations six months before, six months during, and six months after participation comparing the two groups who did and did not complete the municipal solid waste management program.

The mean severity scores of misconduct violations six months before and six months after participation were graphed for the groups who did and did not complete and the program. The severity scores were also multiplied by two before calculating the mean to correct for a six month time frame that allowed for an equal time comparison. The mean severity scores before, during, and after participation for both groups are shown in Figure 4. There was a 65.8% reduction in mean severity scores of misconduct violations from six months before to during the program and a 47.6% reduction from six months before to six months after participation in the

group of individuals who completed the program. There was a 46.8% reduction in the mean severity scores of misconduct violations from six months before to during the program and a 34.1% reduction from six months before to six months after participation in the group of individuals who did not completed the program.

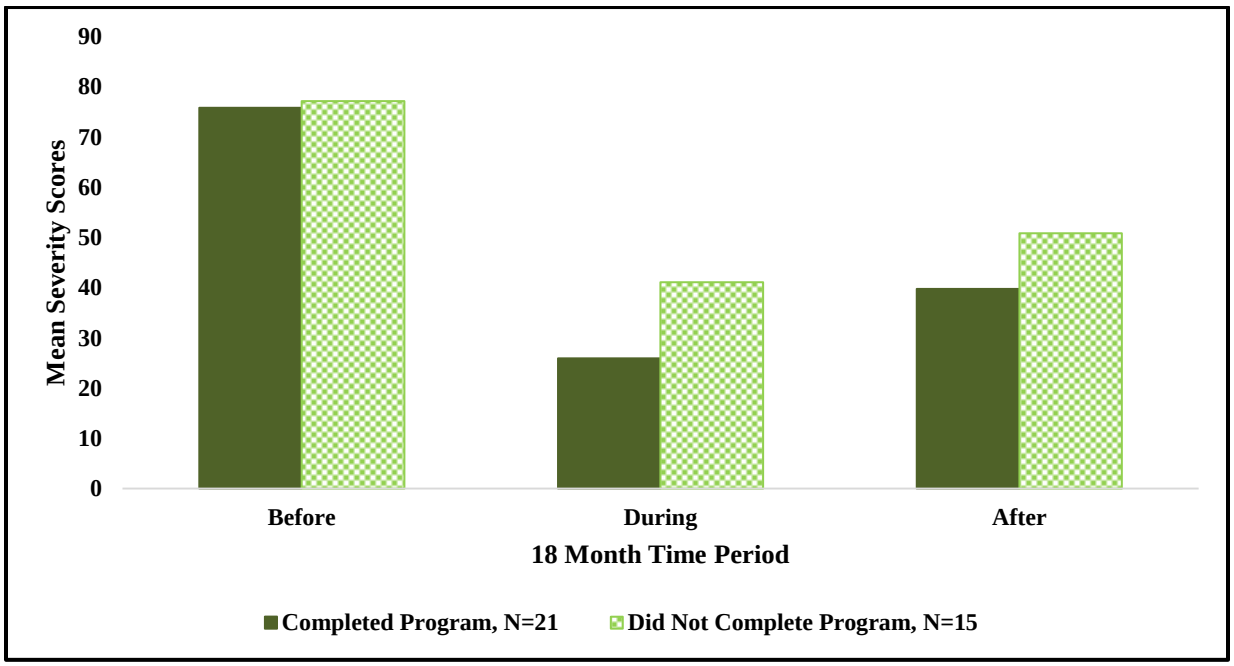

Figure 4. Mean severity scores of misconduct violations six months before, six months during, and six months after participation comparing the two groups who did and did not complete the municipal solid waste management program.

CHAPTER 5
DISCUSSION AND CONCLUSION

Previous studies have demonstrated the positive effects of environmental programming on reducing recidivism rates. However, a method that has not been amply explored is the assessment of institutional misconduct as a measure of behavioral outcomes. The current research monitored institutional behavior associated with participation in a small scale municipal solid waste management program guided by participatory learning. This was accomplished by obtaining counts of misconduct violations before, during, and after individual involvement. The severity of violations was also corrected for and presented. Municipal solid waste management programs, including composting practices, have also been implemented in correctional institutions to provide various benefits. For example, vermicomposting has the potential to provide a wealth of benefits from horticultural and agricultural fertilizer to cost reductions in waste management services. Earthworm activities enhance natural biodegradation and decomposition of wastes anywhere from 60-80%, and can degrade most organic wastes by 80-100% within 6-8 weeks (Hand, Hayes, Frankland, & Satchell, 1988). Due to the temperature requirements of earthworms, the system is limited by being unable to reach temperatures high enough to destroy pathogens in highly susceptible wastes such as food. However, thermophillic composting does not require temperature-tolerant organisms and can reach temperatures high enough to destroy harmful pathogens (Ndegwa & Thompson, 2001). While each practice maintains specific benefits individually, the advantages of their combination have not been abundantly evaluated. Although two composting practices were implemented and maintained, vermicomposting and thermophilic composting, data was not collected or analyzed.

Behavioral Implications

The first objective was to assess behavioral implications of individual participation in a municipal solid waste management program guided by participatory learning. When analyzed, there was a significant difference between the number of misconduct violations before and after participation for participants who completed the program, a 58.5% reduction in the number of misconduct violations, and a 47.6% reduction in the severity of violations committed. There was no significant difference between the number of misconduct violations before and after participation of individuals who did not complete the program. However, there was a 23.5% reduction in the number of misconduct violations and a 34.1% reduction in the severity of violations committed. These results suggest that even participation in the program had a positive effect on institutional behavior. For both groups, those who did and did not complete the program, counts and severity of misconduct violations decreased during active participation in the study. Although they rose slightly after program completion, behavior from both groups was improved when compared to pre-participation counts of misconduct and severity of violations. However, as misconducts tend to decrease over time, six months is not likely long enough identify any aging out effects. Many institutional programs and practices are aimed at reducing recidivism, but another benefit is the effect on institutional behavior. Providing opportunities for incarcerated individuals to occupy their time with positive, productive activities helps reduce idle time that often leads to negative outcomes. Certain programs also provide an incentive for positive conduct if continued participation is contingent upon their behavior (Hutchinson, Keller & Reid, 2009). This can be seen by the decreases in misconduct violations during active participation in the municipal solid waste management program.

The literature supports similar findings illuminating the behavioral benefits of environmental education and exposure to the natural environment. The Sustainability in Prisons Project noted a decrease in recidivism rates in individuals who participated in conservation practices, as well as participants who simply attended a single lecture (The Evergreen State College, 2012). The New York Department of Corrections along with the Horticultural Society of New York also showed recidivism rates in the first year of release as low as 10% for individuals who participated in their conservation programs and 25% after three years (National Institute of Corrections, 2011). This is compared to an average of 42% of individuals re-incarcerated within three years state-wide (Annucci, 2014). Although recidivism rates following participation in comparable programs have been observed, institutional behavior has not. What these findings add to the literature is a small assessment of institutional behavioral implications from participation in an environmental program. The objective was to assess behavioral implications of individual participation in a municipal solid waste management program guided by participatory learning and the results showed positive behavioral changes.

Although a portion of the results did show significance, there were several limitations of the overall study. The sample size was considerably small due to limited time and resources. As a result, it was difficult to draw conclusions from the small extent of the target population. Ideally, the study would have been designed to compare behavior to a group of individuals who participated in an institutional program without environmental or participatory learning components. Comparing the results to a group of incarcerated individuals who were not involved in any other program could have aided in singling out specific elements that affected behavior, as well.

There were also constraints within the classroom setting. Specifically, many of the participants found it difficult to speak freely with certain correctional officers and case workers present as indicated by brief comments in passing. This distrust is common toward outsiders, such as researchers, as well as institutional staff. This is mainly due to neither party possessing the ability to completely control what will be reported as a result of the interactions (Jackson, 1987; Jurik, 1985; Larivière & Robinson, 1996; Robinson, Simourd, & Porporino, 1990; Wright & Saylor, 1992). There is a constant succession of establishing rapport and gaining and maintaining trust between individuals in correctional institutions. There is also a dynamic role reversal in correctional research between researcher, participants, and other staff involved as interviewers, listeners, and observers—further upholding trust and rapport (Patenaude, 2004). Without it, individuals may refuse to participate or deliberately falsify information. They may also simply limit their communications as experienced by the lack of rapport built between certain correctional officers and case workers present throughout the current research.

Other staff-related limitations involved researcher-staff conflicting time frames and staff advocating interests outside of the municipal solid waste management program to the participants. For example, researcher and participants' entry into the program classroom was often postponed as a result of delayed staff assistance. Classroom discussions were also often disrupted by personal opinions and sentiments from staff members originally designed to be reserved for the participating incarcerated individuals. Not only did this add bias to the learning environment, but it contributed to the withdrawal of verbal interaction from program participants. Patenaude and Laufersweiler-Dwyer (2001) noted similar experiences in their experiences with conducting correctional research.

Using institutional misconduct as a measure of behavior also has limitations due to the various factors involved. One of the biggest concerns is the high amount of correctional staff discretion employed in this measure (Poole & Regoli, 1980; Light, 1990). Also, many authors argue that institutional rules are excessively restricting and include behaviors considered acceptable in societal laws (Camp, Gaes, Langan & Saylor, 2003). Sex, race, and experience of institutional staff also have effects on the types and severity of interactions with incarcerated individuals (Camp & Gaes, 2002). For example, while participating in the municipal solid waste management program, individuals who had previously been issued a violation were required to wear bright orange vests to notify other staff members of their misconduct. While some individuals were cited for obvious deviances, physical altercations, many were issued violations for arriving to class minutes late, or for not carrying their passes to move from one location to another (housing unit to medical building) on their person, even if one had knowingly been issued. There were also many limitations to the second objective.

Municipal Solid Waste Management

The second objective was to identify the most efficient arrangement of composting practice to the correctional institution. The municipal solid waste management program included initiating and maintaining two composting practices: vermicomposting and thermophilic composting. To determine which arrangement of composting practices was most efficient, and therefore most beneficial to the correctional institution—vermicomposting followed by thermophilic composting or thermophilic composting followed by vermicomposting—the two groups of incarcerated individuals implemented the arrangements in reverse to one another. At the completion of the entire 40 week program, the combined total solids from each group's trials were designed be evaluated to determine which arrangement of systems composted the

correctional institution food waste more efficiently. Data from the composting practices were not obtained or analyzed. The practices were still carried out to completion due to their overall importance.

The literature indicates that the combination of the practices would have been most beneficial. Ndegwa and Thompson (2001) suggest combining techniques from both vermicomposting and thermophilic composting practices to address large amounts of waste and pathogens and achieve maximum efficiency. However, it is unknown which arrangement of practices is most resourceful, and the findings could have added clarity. The objective was to identify the most efficient arrangement of composting practices to the correctional institution, but the data were unable to be collected and analyzed.

The researcher was only allowed access two days per week, so it was difficult to monitor waste management processes or amend any complications in a timely matter when they arose.

Conclusion

Conducting research in correctional institutions provides a wealth of benefits, but not without challenges—challenges of gaining initial entry, establishing rapport and maintaining trust with both incarcerated individuals and correctional staff, providing feedback to administrators and corrections professionals, and publishing timely and appropriate results (Patenaude , 2004). Patenaude (2004) suggests the only ways to overcome the obstacles are for researchers to step up for correctional studies and administrators to grant them access to do so. Unfortunately, there is much more that needs to be addressed in outreach and education efforts in correctional settings. As Traniello (2015) notes, without first addressing the underlying causes of inequality, outreach and education can only go so far within the confines of correctional institutions. Individuals will still face the same obstacles, the same lack of alternatives, upon

their release as they did before their incarceration period. Providing environmental education to incarcerated individuals who are socially and stigmatically prevented from receiving higher education is discouraging. Traniello (2015) recommends scientists and social activists come together to advocate the educational benefits to all individuals regardless of socioeconomic background.

Until policies recognize these needs, it is important to incorporate vocational skills into educational programs for these reasons. As many individuals are exempt from educational opportunities outside the correctional institution walls, developing ways to incorporate knowledge with practical job skills can aid in the challenging transition for incarceration to society. This is one of the key components of the municipal solid waste management program: environmental education that can be used to practice eco-friendly strategies upon release, such as composting—composting practices that can also generate income if the right amount of time and energy are appropriately exerted.

Correctional institution populations and recidivism rates in the United States remain high and the impacts can be seen at the individual, institutional, and environmental levels. Environmental sustainability practices such as municipal solid waste management have the potential to improve behavior of incarcerated individuals who participate, decrease correctional institution operating costs, and reduce negative environmental impacts. Future research would benefit the corrections' field by expanding individual sample sizes, identifying the principal elements of behavioral by comparing the behavior of individuals involved in other forms of institutional programming, establishing rapport and gaining and maintaining trust between individuals in correctional institutions, clarifying and maintaining staff boundaries, and accounting for the discretion in using institutional misconduct as a measure of behavior. In terms

of municipal solid waste management programs within correctional institutions, the natural and biological sciences' fields could benefit by providing concise training to individuals involved in administering sustainability programs and verifying adequate access to relevant environmental practices to maintain the integrity of the conservation systems.

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APPENDIX A
MUNICIPAL SOLID WASTE MANAGEMENT PROGRAM CONSENT FORM

MUNICIPAL SOILD WASTE MANAGEMENT PROGRAM CONSENT FORM

Title of Study: Behavioral implications of a cognitive-behavioral focused environmentally sustainable waste management program guided by participatory learning within a medium-security correctional institution

Identification of Researchers: This research is being conducted by Hannah Rogers, a graduate student in the Department of Biology and Agriculture, and Scott Chenault, a professor in the Department of Criminal Justice at the University of Central Missouri.

Purpose of the Study: The purpose of this study is to find out whether inmate participation in a composting and environmental education program affects behavior. The study also aims to determine the most efficient arrangement of composting practices to the correctional institution.

Request for Participation: We are inviting individuals to participate in a study on the behavioral effects of participation in a composting and environmental education program. Participation is completely voluntary, and program resignation is acceptable at any time for any reason without penalty.

Exclusions: Participation in the program will be voluntary, and individuals will be eligible if they are over 18 years of age, have at least one documented institutional infraction during their current incarceration period prior to participation in the study, have at least nine months remaining on their sentence at the onset of the study, and possess the ability to rake, shovel, and operate a wheel barrow.

Description of Research Method: Researcher and participants will meet twice weekly for two hours each day for a total of 12 weeks. The first day of the week will be reserved for in-class environmental education, observation, and planning, and the second day for hands-on learning, including maintaining and sampling composting practices. Participants will learn sampling techniques and procedures including monitoring temperature, moisture, and pH levels. Participants will also be exposed to broad environmental conservation and sustainability topics and will develop or improve green job skills. Behavioral misconducts of all participants will be obtained from institutional records six months prior to program participation, throughout the duration of the study, and six months post program participation. Program resignation is acceptable at any time for any reason without penalty. Participants are also encouraged to address questions regarding program results or individual rights to the researchers listed below at any time.

Privacy: Participant roles in the study will be completely confidential. All misconduct data will be provided by inmate identification number. During the coursework portion of the study inmates will be identified by name. Therefore, the researcher will not be able to tie specific offenders to their misconduct. All data will be kept confidential. Participants are also encouraged to address questions regarding program results or individual rights to the researchers listed below at any time.

Explanation of Risks: Participants will be expected to possess the ability to rake, shovel, and operate a wheel barrow. However, such activities will be done on a limited basis in short increments of time. There are no injuries anticipated with the study. The potential risks of injury associated with raking, shoveling,

and operating a wheel barrow during the study are also possible risks of injuries that may occur in everyday life. The correctional institution will remain responsible for any medical treatment required for any participant during the study.

Explanation of Benefits: Participant benefits from completing the study include a vermicomposting and thermophilic composting certification and a reference letter from the primary researcher. Participants will also have the opportunity to develop highly sought after green job skills and research methods, improve critical thinking and communication skills, foster a positive rapport with other participants and staff, and increase environmental knowledge.

Questions: If you have any questions regarding the study at any time, please feel free to contact Hannah Rogers at hrogers@ucmo.edu or Scott Chenault at chenault@ucmo.edu. If you have any questions associated with your rights as a research participant, you can contact the Human Subjects Protection Program at the University of Central Missouri at 660.543.4621 or the researchers listed above.

_____ _____

Signature of Primary Researcher Date

_____ _____

Signature of Co-Researcher Date

PARTICIPANT'S STATEMENT

I have been given a written summary of the research study. I have had an opportunity to ask questions, and the study has been thoroughly explained to me. It has been clearly emphasized to me that my role in the above and referenced research study will be completely confidential, that I can address questions regarding program results or my rights as a participant to the researchers listed above at any time, and that program resignation is acceptable at any time for any reason without penalty. I voluntarily consent to participate in this research study.

_____ _____

Printed Name of Participant Date

_____ _____

Signature of Participant Date

_____ _____

Printed Name of Witness Date

_____ _____

Signature of Witness Date

Copies to: Participant
Faculty Advisor's File
Participant's Institutional File

APPENDIX B
MUNICIPAL SOILD WASTE MANAGEMENT PROGRAM SYLLABUS

Title of Program: Municipal Solid Waste Management Program
Instructor: Hannah Rogers, Department of Biology and Agriculture, University of Central Missouri
Contact Information: hrogers@ucmo.edu
Class Meeting Time: Tuesday and Thursday 12:30-2:30

Program Objectives

The primary objective of this program is to introduce participants to various waste management practices and expose them to planning, constructing, maintaining, and analyzing both traditional composting and vermicomposting systems. To meet these objectives, participants will plan and conduct hands-on scientific investigations on a weekly basis. They will also be encouraged to work as a group, bring outside experiences and skill sets into the program, ask questions, observe, make predictions, describe and classify biological processes, take responsibility for the care of living organisms, and gather and record data accurately.

Participant Learning Objectives

- Identify options for solid waste management
- Discuss the components and benefits of traditional thermophilic composting and vermicomposting
- Apply knowledge of composting components to discuss appropriate systems for various situations and locations
- Understand basic earthworm biology and popular species used for vermicomposting
- Identify common areas of difficulty in composting systems
- Use collaboration skills to develop resolutions to composting challenges
- Discuss and constructively critique mainstream food waste disposal methods and outcomes
- Convey the strengths and weakness of each mainstream food waste disposal method in written form
- Identify benefits and uses of composted material
- Discuss the local market potential for composted material
- Discuss common terminology associated composting systems and how to communicate effectively with potential employers
- Identify components of a resume and where to include and highlight skill sets
- Recognize and discuss further environmental sustainability practices
- Utilize composting terminology and concepts to communicate the benefits of environmental suitability practices to the class
- Discuss the importance and benefits of environmental consciousness
- Recognize the power of interdisciplinary work, participatory learning, and consilience
- Exhibit responsible decision-making

- Review and reflect upon initial hypotheses/predictions
- Organize, analyze, and discuss concluding data
- Identify time management practices for remainder of incarceration period

All participant learning objectives will be measured by continuous handwritten and verbal communication throughout the program and assessed by the primary researcher. For example: coming to class with discussion topics already in mind, keeping a written log of composting observations, analyzing data as a group, brainstorming solutions to composting challenges that arise, and similar tasks.

Tentative Schedule

Week 1: Introductions, Project Logistics, and Personal Vermicomposting Jars

Participant learning objectives: **(Day: 1)** Identify the five options for solid waste management: source reduction and reuse, recycling, composting, waste-to-energy, and sanitary landfills; communicate personal interests and skill sets with the class **(Day: 2)** discuss and determine appropriate care and habitat requirements of captive earthworms; create suitable personal vermicomposting jars for observation

Homework: TBD

Week 2: Components and Benefits of Vermicomposting

Participant learning objectives: **(Day: 1)** Discuss the components and benefits of vermicomposting; **(Day: 2**) take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

*Homework:*TBD

Week 3: Components and Benefits of Composting

Participant learning objectives: **(Day: 1)** Discuss the components and benefits of traditional thermophilic composting; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 4: Choosing the Right Composting System and Worms

Participant learning objectives: **(Day: 1)** Apply knowledge of composting components to discuss appropriate systems for various situations and locations; understand basic earthworm biology and popular species used for vermicomposting; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 5: Composting Troubleshooting

Participant learning objectives: **(Day: 1)** Identify common areas of difficulty in composting systems; collaborate with the class to develop resolutions to composting challenges; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 6: Food Waste Accumulations: Landfills and Water Treatment Facilities

Participant learning objectives: **(Day: 1)** Discuss and constructively critique mainstream food waste disposal methods and outcomes; convey the strengths and weakness of each food waste disposal method in written form; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 7: Benefits and Uses of Composted Material

Participant learning objectives: **(Day:1)** Identify benefits and uses of composted material; discuss the local market potential for composted material; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 8: How to Apply Newly Developed or Expanded Skills upon Release

Participant learning objectives: **(Day: 1)** Discuss common terminology associated composting systems and how to communicate effectively with potential employers; identify components of a resume and where to include and highlight skill sets; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 9: Further Environmental Sustainability Practices and Benefits

Participant learning objectives: **(Day: 1)** Recognize and discuss further environmental sustainability practices; utilize terminology and concepts learned to communicate the benefits of environmental suitability practices to the class; discuss the importance and benefits of environmental consciousness; recognize the power of interdisciplinary work, participatory learning, and consilience; **(Day: 2)** take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 10: Personal Benefits of Connecting with the Natural Environment

Participant learning objectives: **(Day: 1)** Explore the interactions between organisms and the natural environment; discuss the beneficial and harmful effects of humans on the environment; identify ways to connect with the natural environment; **(Day: 2**) take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 11: Wild Card

Participant learning objectives: **(Day: 1)** Exhibit responsible decision-making in choosing a final topic/project/area of interest to cover; **(Day: 2**) take, record, and interpret the results of system measurements including temperature, pH, moisture content, and weight; record and verbally communicate observations such as worm food preferences, changes in behavior, changes in population numbers, etc.

Homework: TBD

Week 12: Program Completion, Data Analysis, and Composting Certificates

Participant learning objectives: **(Day: 1)** Review and reflect upon initial hypotheses/predictions; organize, analyze, and discuss concluding data; identify time management practices for remainder of incarceration period; **(Day: 2)** accept composting certificates

Homework: Keep up the good work!

APPENDIX C
INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

Human Subjects Protection Program
Ward Edwards 1800
Warrensburg, MO 64093
Office 660-543-4621
FAX 660-543-4778
www.ucmo.edu

5/22/2014

Hannah Rogers
hrogers@ucmo.edu

Dear Hannah Rogers,

Your research project, 'Behavioral implications of a cognitive-behavioral focused environmentally sustainable waste management program guided by participatory learning within a medium-secuirty correctional institution', was approved by the Human Subjects Review Committee on 5/22/2014. Your informed consent is also approved until 5/22/2015.

Please note that you are required to notify the committee in writing of any changes in your research project and that you may not implement changes without prior approval of the committee. You must also notify the committee in writing of any change in the nature or the status of the risks of participating in this research project.

Should any adverse events occur in the course of your research (such as harm to a research participant), you must notify the committee in writing immediately. In the case of any adverse event, you are required to stop the research immediately unless stopping the research would cause more harm to the participants than continuing with it.

At the conclusion of your project, you will need to submit a completed Project Status Form to this office. You must also submit the Project Status Form if you wish to continue your research project beyond its initial expiration date.

If you have any questions, please feel free to contact me at the number above.

Sincerely,

Janice Putnam Ph.D., RN
Associate Dean of The Graduate School
putnam@ucmo.edu

APPENDIX D
MISSOURI DEPARTMENT OF CORRECTIONS TRANSFER AGREEMENT

MISSOURI DEPARTMENT OF CORRECTIONS
PLANNING, RESEARCH AND EVALUATION UNIT

TRANSFER AGREEMENT FOR RESEARCH PURPOSES

The Missouri Department of Corrections views correctional research activity as an important and worthwhile endeavor and a vital means of improving correctional management practices. Cooperative research projects, which involve outside researchers, are encouraged so long as the projects conform to recognized professional standards, including those relating to privacy, confidentiality and the protection of human rights.

The purpose of this transfer agreement is to ensure that research and evaluation projects conducted by non-agency researchers is carried out with the highest regard for individual and organizational concerns related to privacy, confidentiality, human rights, security and professionalism. The undersigned agree to abide by all current and relevant department policies and procedures governing research and evaluation activities in the Department of Corrections and any other related state or federal statutes, requirements or regulations.

PROJECT NAME AND PURPOSE:

Behavioral implications of a cognitive-behavioral focused environmentally sustainable waste management program guided by participatory learning within a medium-security correctional institution

Environmental sustainability practices, including waste management, can improve individual health and behavior by facilitating a connection between inmates and the natural environment (Kuo & Sullivan, 2001; Burns, 2005; Grinde & Patil, 2009; Weinstein, Przybylski, & Ryan, 2009). In addition, waste management practices can also be initiated and operated at low or no cost to the correctional institution, and save institutional funds by simple diversion procedures.

The first objective is to identify and assess behavioral implications of inmate participation in a cognitive-behavioral focused waste management and environmental education program utilizing participatory learning techniques. The program will be directed toward inmates and will be comprised of developing composting strategies and techniques, as well as exposure to environmental education. The program will be instructed utilizing cognitive-behavioral techniques, and will place an emphasis on participatory learning. Recent studies suggest targeting crime-specific factors while addressing mental health may enhance and expand work addressing criminogenic behavior (Shuker & Newton, 2008). Accordingly, our methods focus on cognitive-behavioral approaches that enhance self-control, improve cognitive style, and emphasize pluralistic ways of thinking, learning, and acting to foster success within the program, and build essential technical and behavioral skills for reentry into society.

The second objective is to identify and implement the most efficient arrangement of waste management practices to the correctional institution. Vermicomposting, or the process by which earthworms are used to compost organic waste material, is one environmental sustainability practice that has the potential to provide a wealth of benefits from horticultural and agricultural fertilizer to cost reductions in waste management services (Pierre, Phillip, Margnerite, & Pierrette, 1982). Earthworm activities enhance natural biodegradation and decomposition of wastes anywhere from 60-80%, and can degrade most organic wastes by 80-100% within 6-8 weeks, making composting practices both practical and timely for correctional institutions with large amounts of organic waste (Hand, Hayes, Frankland, & Satchell, 1988). Furthermore, traditional thermophillic composting does not require temperature tolerant organisms, such as earthworms, and can reach temperatures high enough to eliminate harmful pathogens within the composted material (Ndegwa & Thompson, 2001).

Two, 12 week programs will be administered comprising of 20 participants each. Researcher and participants will meet twice weekly for two hours each day—totaling a 48 hour program. The first 12 week program with 20 participants will begin June 2, 2014 and end on August 22, 2014. The second 12 week program with 20 participants will begin on August 25, 2014 and end on November 14, 2014.

Participation in the program will be voluntary, and individuals will be eligible if they have at least one documented institutional infraction during their current incarceration period prior to participation in the study, have at least nine months remaining on their sentence at the onset of the study, and possess the ability to rake, shovel, and operate a wheel barrow.

IS DATA REQUIRED IN IDENTIFIABLE FORM? IF SO, PLEASE EXPLAIN.

Yes, counts of behavioral misconducts will be obtained from Booneville Correctional Center records six months prior to program participation, three months during program participation, and six months after program participation for each of the 40 participants.

WHY IDENTIFIABLE DATA IS REQUIRED.

Counts of misconduct violations for each of the 40 participants are required in order to assess the impact of the program.

HOW WILL PRIVACY AND CONFIDENTIALITY OF THE DATA BE SAFEGUARDED?

All misconduct data will be provided by inmate identification number. During the coursework portion of the study inmates will be identified by name. Therefore, the researchers will not be able to tie specific offenders to their misconduct. Once data is obtained from Booneville Correctional Center records, it will be kept in a locked file cabinet in Scott P. Chenault's office (University of Central Missouri, Humphreys Building 300).

HOW WILL THE IDENTIFIABLE DATA BE DISPOSED OF UPON COMPLETION OF THE PROJECT?

Data will only be obtained six months after completion of the program. At that time, the data will be kept in a locked file cabinet in Scott P. Chenault's office (University of Central Missouri, Humphreys Building 300) while being analyzed and then shredded.

FINAL REPORT REVIEW AND DISSEMINATION

One (1) copy of the resulting research report will be provided to the Director of Research and Evaluation. The Director of Research and Evaluation will be notified of subsequent publication of the research finding.

The Department of Corrections reserves the right to withdraw from any cooperative research or evaluation project agreed to under this arrangement if departmental policy and procedures are not strictly followed.

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PROJECT REVIEWED AND TRANSFER APPROVED

BY: David Hodge TITLE: Director of Research & Evaluation DATE: 5/7/14