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Horticulture program curriculum development project for the Michigan Department of Corrections

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Horticulture program curriculum development project for the Michigan Department of Corrections

by

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Abstract

Different forms of education have been a part of prison education systems for many years. Career and Technical Education programs have been utilized by many states and the federal correctional departments in educating prisoners for decades. Providing inmates with CTE programs has long been used to lower recidivism. A new curriculum was introduced to the Horticulture trades programs within the Michigan Department of Corrections beginning in March of 2018. This new curriculum was structured around the Michigan Nursery and Landscape Association's Certified Green Industry Professional curriculum and the Michigan Department of Agriculture and Rural Development Certified Pesticide Applicator license materials. These curricula were selected because they provided the opportunity for the student to obtain industry certifications prior to parole or release. However, there was a lack of application of the knowledge and skills learned from these curricula. Using Bloom's Taxonomy of Learning to move the students to higher levels of the hierarchy, this creative component developed four laboratory lessons with paired lesson plans, which featured application, along with higher levels, to fill the void in the curricula. The developed labs included Lawn Installation, Irrigation Controller Programing, Hardscaping, and Flower Garden Design.

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Introduction

Different forms of education have been a part of prison education systems for many years. Career and Technical Education (CTE) programs have been utilized by many states and the federal correctional department in educating prisoners for decades. In Michigan, horticulture programs have been implemented in correctional facilities since 1984. Today, many states offer horticulture or gardening programs within their correction facilities. California, New York, Florida, Pennsylvania, and Texas (Jenkins, 2016) are just some of the states that have horticulture-related programming within their prison systems. Some of these states have partnered with colleges to aid or administer the programs, while others rely on volunteers. In Michigan, horticulture programs are run by state employed trades' instructors. Because of this, horticulture programs in correctional facilities can look very different structurally; some prisons use the horticulture programs to supply food for their kitchens, others donate their produce to local food pantries, and there are facilities that support programs with landscape gardens which the students maintain and care for within the facility.

Value to Inmates

No matter how horticulture programs are used in correctional settings, growing flowers, vegetables, and fruits gives individuals an opportunity to be productive in the correctional setting. This, in turn, increases self-esteem and pride (Nichnadowicz, 2015). It also allows them to give back to a community that they may have failed. Providing inmates with CTE programs has long been used to lower recidivism. Recidivism is the tendency of a convicted criminal to return to criminal behavior and return to prison (Maltz, 1984). Providing skills in the horticulture field has been proven to lower these rates. Inmate gardeners had recidivism rates of only 5% to 10% (O'Connor, 2014) compared to the state of Michigan's average among all

prisoners of 31% (Pew Center on the States, 2011). Education for prisoners reduces recidivism by 43%, no matter what education program they are in (Irving, 2016). If these programs can effectively train students to be able to work in the field, they will in turn be more employable. Having the proper skills will increase their ability to get jobs and will; hopefully, help them to stay away from a life of crime.

Programming Barriers

However, horticulture programs have their challenges. As a Horticulture Trades Instructor in the correction program setting, and from my experience over the last several years teaching in this setting, access to resources is limited. It can be difficult to obtain educational materials such as books and reference materials, along with tools and equipment, on a limited budget. Combined with facility logistics and security requirements of the facility, instructors have difficulty obtaining proper resources.

Having internet access as a resource in the classroom is something most educators take for granted. In my classroom, there is no internet access because internet is considered a security concern. The fact that an inmate could gain access to the internet scares many facility administrators. This may not be the case at all facilities. Going to my computer during class and pulling up a YouTube video on planting balled and burlaped trees is not a possibility for me. It takes preparation and forethought to utilize videos in my program. It can be done; it just requires more preparation and setup by the instructor. It would be great for a student to be able to go to a computer and watch a video on demand if they are struggling with a specific topic, but there are no computers for my students to use, or the connection for them to do so in my classroom currently. For me, this prohibition prevents the access to a vast resource.

When it comes to building or construction materials and tools, it can be very difficult to gain approval because of security reasons. Most horticulture programs in high schools and at technical schools don't have to worry about students fighting each other with brick pavers. Prison instructors have this concern. In the correctional setting they are considered weapons and must be properly secured. This creates a logistical conundrum for instructors in this setting. Therefore, instructors must find creative ways to help the students to apply and practice the knowledge and skills gained in their programs with the limited amount or resources and equipment they have.

Professional Background

Growing up on a farm in southwest Michigan I had always wanted to be part of the agriculture industry. After college, and after working in the horticulture field for six years, I realized that horticulture was a viable path for me. I had always wanted to be an asset to any industry that I worked in, but I felt as if horticulture would allow me to be part of the greater agriculture community, while doing something I had found a passion in. My career objective has always been that I wanted to have a positive impact on the green industry every day. This is evident as I am furthering my education to become a better educator and wanting a better curriculum for the program in which I currently teach.

When I first thought about pursuing my master's degree, it was because I wanted to become a more effective and efficient teacher. I grew up with both of my parents as teachers and had vowed that I would never become one. Life circumstances had other plans apparently. I had not thought about furthering my education or going back for another degree, and it didn't seem feasible with my life situation at the time. As I began talking about it with my wife and looking at the benefits of having a master's degree, I began to realize that pursuing a master's degree in

Agriculture Education could be a wonderful opportunity to become a more effective and efficient teacher. Not only that but it could also open new career opportunities for me. Obtaining a master's degree in my current position came with a decent pay raise. This was considered and helped me in ultimately making the decision to further my education.

I began teaching horticulture for the Michigan Department of Corrections (MDOC) in 2010. On a whim, I had applied for a Horticulture Trades instructor position with the MDOC at the Muskegon Correctional facility (MCF). I had zero teaching experience and had only worked in the field. Along with the fact that I was a year and a half removed from graduation from Michigan State University with my Bachelor of Science in Horticulture. At the time, I was working at a large landscape company, where I did not feel that my skills and talents were being used to their fullest potential. The only connection I had with teaching was that both of my parents were teachers at one point. MCF, at the time was contracted to house prisoners from Pennsylvania where there was a desire to add additional career and technical education programs besides the culinary arts program. I was hired in the fall of 2010. Eight months later the contract was cancelled, and I was laid off. After fifteen months of working for a landscape company, I was recalled to my position as the Horticulture Trades Instructor at MCF. This time the facility would be housing Michigan prisoners.

When I began teaching for the MDOC in 2010 there were ten horticulture programs statewide. Today the number of horticulture programs is down to four. When I began working for the department back in 2010, I had emphasized the need for outside certificates for our students, as the curriculum I was given didn't have this as part of the program. Upon returning in 2012, I pressed the issue with department staff of including industry certifications as part of our horticulture programs. In 2016, I was asked to be part of the team tasked in developing a plan

for a new curriculum. The other team members and I saw a great opportunity to be able to provide industry certification to the students of our programs.

I hadn't always thought that pursuing a master's degree would be something I was interested in. Since I returned to teaching the idea kept coming to the forefront of my mind. In the spring of 2016 I began working towards my master's degree. In looking at the current program curriculum and its requirements, I saw this as a great opportunity to improve the horticulture programs and my teaching skills. This project is the culmination of this effort.

Project Goals

A new curriculum was introduced beginning March of 2018. This new curriculum is structured around the Michigan Nursery and Landscape Association (MNLA) Certified Green Industry Professional (CGIP) curriculum and the Michigan Department of Agriculture and Rural Development (MDARD) Pesticide Applicator license materials. These curricula were selected because they provide the opportunity for the student to obtain industry certifications prior to exiting the program and prior to parole or release. The MNLA was flexible and was willing to work with us on implementing their curriculum and were excited about the opportunity. However, the downfall to using these curriculums is that there are no required labs or hands-on application as part of the curriculums.

The horticulture programs within the MDOC are structured as an adult CTE program. According to Scott and Sarkees-Wircenski (2008), CTE serves the purpose of providing learning experiences that help student explore career areas and prepare the students for employment and independent living. However, there was a void in the curriculum of direct application of knowledge and skills within the horticulture field. Having labs where the students applied the procedural knowledge would be very helpful for the students in the horticulture programs within

the MDOC in preparing them for real job situations. The better the programs are at preparing students for the job world, the less likely the student is to come back into the penile system. In CTE programs, students acquire the theoretical and cognitive knowledge in a classroom and then apply that knowledge to a known situation, where the students rely upon the recently learned knowledge to perform a series of tasks in an occupational-like setting (Scott & Sarkees-Wircenski, 2008; Threeton, Clark, & Ewing, 2010). The goal of this project was to provide the students with additional learning experiences that replicated industry experiences and furthered their understanding and knowledge of the horticulture industry. In these experiences, the students would gain experience and skills, thus filling the void in their learning and experiences. The developed labs will strengthen the horticulture programs with the MDOC. I wanted to create thinkers as opposed to students who simply recalled the information. To accomplish this, it was important to incorporate activities that stimulated higher levels of thinking into lesson plans and tests (Bloom, 1956). I also want to create do-ers, who can make things as well as think about things. These are also higher levels of learning.

Under the current curriculum format, students were required to read about landscaping principles. They were not required to apply their learning through use of skills and techniques. They were required to know the information for the certification test. The student may be asked to complete calculations for landscape construction problems, such as patio building materials needed. They would be asked to provide written competencies of the steps to build the patio on a test, but the student would have never performed the process or task of building a patio directly.

The labs that I developed provide the learner with a mock setup, a simulation, of the real application of the practice. The labs encourage higher level thinking and comprehension of the

topic. There are other aspects of the horticulture program that provide the student with application, such as the vegetable gardening section, where students are able to gain direct hands-on application experience. Students plan their vegetable gardens and go through all the steps involved in planning and designing their garden, to planting, maintaining, and harvesting the produce from their gardens. The students must use different resources to create the planting schedules for their gardens. Each lab has the student participating in, and directly practicing, the application of the specific technique or skill. The direct experiential encounter with a learning experience requires the student to actively engage. It is not a passive association that is commonly associated with teacher directed instruction that generally results in minimal student interaction within the learning process (Threeton, Clark, & Ewing, 2010). Students will eventually reach the point where they can make their own decisions regarding ways to handle an industry situation.

Methods

The framework for this project was based on Bloom's Taxonomy of Learning (Bloom, 1956). The Taxonomy was developed by Benjamin Bloom in the 1950s as a way to categorize the levels of reasoning skills required in learning situations The taxonomy has been revised by different people; most divide the taxonomy into two dimensions: a cognitive dimension, and a knowledge dimension (Anderson et al., 2001).

For the purpose of this project I will use (a) factual, (b) conceptual, (c) procedural and (d) metacognitive as the types of knowledge students may be expected to acquire through the curriculum. The base level knowledge is factual knowledge, whereas the highest level is metacognitive (or self-knowledge). The cognitive dimension begins with lower -level thinking skills and moves up to higher-level thinking skills. In the cognitive domain, I will use (a)

remembering, (b) understanding, (c) applying, (d) analyzing, (e) evaluating, and (f) creating as the levels in the cognitive dimension.

Learning activities asked of the student in the current MDOC horticulture curriculum are mainly in the lower-level cognitive domain (Table 1).

Table 1. Location of New Horticulture Curriculum MDARD Certified Pesticide Curriculum & MNLA Curriculum according to Bloom Levels

Levels of Bloom	Cognitive Dimension					
Knowledge Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	MDARD, MNLA					
B. Conceptual	MDARD, MNLA	MDARD, MNLA				
C. Procedural	MDARD, MNLA					
D. Metacognitive						

The purpose of these new labs was to add different activities in order to move the students up the levels into higher level thinking. When learning is looked at as a process, the primary focus should be engaging students in a way that best enhances their learning (Kolb & Kolb, 2009). I want the students to have an active part in their own learning process. Having curricula that drives them into higher level thinking will better prepare them for jobs. With the current curricula based in the lower levels of Bloom's Taxonomy, I don't feel that the students are truly engaging in the learning process. In designing these labs, it will require the learners to apply the knowledge learned, in some cases by creating something.

Product

The proposal included the creation of five labs pertaining to the horticulture curriculum for the MDOC horticulture program but the plan was readjusted for four in March 2018. The

labs were created in Microsoft Word. Table 2 lists the titles of the labs and the aggregate Cognitive and Knowledge levels based on Bloom's Taxonomy from the proposal. The Contractor Level Lab was approved to be removed from the list.

Table 2. Corresponding Bloom levels for Projected Lab and Lesson Plan Combinations

Lab title	**Cognitive Level**	**Knowledge Level**
Lawn Installation	Apply	Conceptual, Procedural
Irrigation Controller setup	Apply, Analyze	Procedural
Flower Garden Design Project	Apply, Analyze, Evaluate, Create	All
Patio Installation	Apply, Analyze, Create	Factual, Conceptual, Procedural
Using a Contractor Level*	Apply	Conceptual, Procedural

***Removed and not completed**

Table 3 shows the cognitive level and knowledge level based on Bloom's Taxonomy for the corresponding lab. In addition to the higher levels of thinking according to Bloom, all the labs also would include remembering and understanding as cognitive levels, which is covered through the reading materials and is generally the level they are tested on.

Table 3. Updated Labs based on Bloom's Cognitive and Knowledge levels

Lab title	**Cognitive Level**	**Knowledge Level**
Lawn Installation	Apply, Analyze	Conceptual, Procedural
Irrigation Controller setup	Apply, Analyze	Procedural
Flower Garden Design Project	Apply, Analyze, Evaluate, Create	All
Hardscape Installation	Apply, Analyze, Create	Factual, Conceptual, Procedural

Analysis

In Table 4, I have provided an evaluation of how many times each of the categories was used based on the objectives in each of the units. The number in each box represents the number of times within each lab that the corresponding level is coved by an objective.

Table 4. Bloom's Cognitive Level used in each Lab

Lab Title	Bloom's Taxonomic Level used					
	Remembering	Understanding	Application	Analysis	Evaluating	Creating
Lawn Installation	3	2	6	3	0	0
Irrigation Controller setup	2	2	5	2	1	0
Hardscape Installation	4	5	5	5	0	1
Flower Garden Design Project	4	4	2	5	1	3

The labs differ in the frequency with which they promote the taxonomic levels of Bloom, as well as the number of times each level is covered within each lab. The goal of the project was to move students beyond just the basic remembering and understanding levels to the higher-level thinking of application, analysis, evaluation, and creation. With the addition of these labs into MDOC horticulture curriculum it will help get closer to achieving that goal, as many of the labs have multiple instances where the objectives cover the higher levels. With additional lab possibilities in the future, I can visualize where they would fit on a table like this.

Summary of Labs

Below is an analysis of each lab which includes an evaluation of the content objectives from corresponding lesson plan and how they relate to the cognitive level of Bloom's taxonomy. It also provides a brief description of the strategies corresponding with the levels of Bloom.

Lawn Installation Lab

The Lawn Installation lab was developed for the students who are studying Landscape Construction and or Landscape Maintenance in the Landscape tract of the Tier 2 curriculum. The lab is designed for the student to go through the complete process of steps in installing and establishing a lawn area.

Two common methods of establishment of turfgrass seen in the industry are used in the lab. The main aspect of this lab is application. This is evident as seen in Table 5 below, with all six objectives corresponding in the application level of Bloom. The students apply what they have learned through performing the process of steps. For the learner, going through the performance of the process moves the learner from the lower level knowledge and comprehension levels of Bloom's taxonomy, to the application and analysis levels. The process the student goes through gives a better understanding along with an ability to perform the task if the student was on a job site. It is important to make sure they are following industry standards as they complete the lab. In this lab, students need to be able to read grass seed labels and fertilizer labels, to calculate, infer, and identify the amounts of material required to complete the task on a job site.

Table 5. Lawn Installation Lab evaluation of objectives

Summary of Content	Blooms taxonomic level	Suggested instruction strategies
Demonstrate proper tool use and equipment safety practices.	Remembering, Application, Analysis	**Identify, Check, Operate, and Perform:** Through reading text, watching videos, continual application of practices.
Demonstrate the process of steps in preparing a site for establishing a turfgrass area.	Application, Analysis	**Identify, Perform:** Using proper tools and techniques to manipulate materials
Be able to read a seed label.	Remembering, Understanding, Application, Analysis	**Identify, Interpret, Infer:** From reading text, through watching the videos, using materials and completing industry scenario problems
Be able to install and establish a turfgrass area using seed.	Application	**Perform:** Using proper tools and techniques to manipulate materials
Be able to install and establish a turfgrass using sod.	Application	**Perform:** Using proper tools and techniques to manipulate materials
Know how to calculate the proper amount of fertilizer and seed needed for the given area.	Remembering, Understanding, Application	**Identify, Check, Solve:** Completing industry scenario problems, reading text and through watching the videos

Irrigation Controller Lab:

The Irrigation Controller Lab was written for the students who are studying Landscape Construction or Landscape Maintenance in the Landscape tract of the Tier 2 curriculum, as it would be used for students completing either curriculum. The base Taxonomy level for this lab was application, again corresponding to five of the seven objectives shown in Table 6. Diving deeper into this lab, I realized there were aspects that would be in the analysis and evaluation levels of Bloom's Taxonomy. The questions in this lab require the student to reflect on effects of improper irrigation programing, moving them in to the higher levels of thinking. The base

knowledge of programming is driven home through the physical manipulation of the irrigation controller. The possibilities for continuing from this lab offer great potential for the students. Irrigation trouble shooting, irrigation system installation and adjustment, are a few of the possible labs that come to mind as possibilities in the future. With some of my students having no previous knowledge, the job scenario gives them a feel for how the role of the customer functions in the industry.

Table 6. Irrigation Controller Lab evaluation of objectives

Summary of Objectives	Blooms Taxonomic level	Suggested instruction strategies
Be able to describe the capabilities and function of an irrigation controller.	Remembering, Understanding, Analysis	**Summarize, Clarify**: From reading text and owner's/operator's manuals and through watching the videos
Be able to set time and date of an irrigation controller.	Application	**Perform**: Physical manipulation of equipment
Set time and date of an irrigation controller.	Application	**Perform**: Physical manipulation of equipment
Be able to program irrigation zone run times.	Application	**Perform**: Physical manipulation of equipment
Be able set start times for single and multiple irrigation programs.	Application	**Perform**: Physical manipulation of equipment
Be able to manually start any irrigation zone.	Application	**Perform**: Physical manipulation of equipment
Explain effects of incorrect programming as it pertains to the landscape.	Remembering, Understanding, Analysis, Evaluation	**Summarize, Differentiate, Check, Reflect**: From reading text and owner's/operator's manuals and through watching the videos

Hardscape Lab

The Hardscape lab was written for the students who are studying Landscape Construction in the Landscape tract of the Tier 2 curriculum. I was extremely excited to use this lab, as it was one of the first labs I had written after beginning to work as a Horticulture Trades Instructor within the MDOC. The lab has drastically changed since its origination a few years ago. Using it as part of my creative component was an eye-opening experience. I see things much differently now, having gone through master's program classes along with looking at it in terms of being able to move the learner up the taxonomic levels of Bloom, to higher level thinking. To see the progression of what this lab was, to what it is now, gives me hope that I can change some of the other materials in our program curriculum with confidence. In this lab, five of the objectives correspond with the understanding, application, and analysis levels of Bloom as shown in Table 7.

This lab was separated into four individual parts. The first two parts are calculations, while the second two were the application portions. Part 4 of this lab will be written later, as this would be the application of building a retaining wall. I feel it is very important in understanding the process of hardscape installation to know how to calculate the materials needed. It helps drive home the use of the materials on the job. It also provides an understanding when they get a job of why they need to have the amount of material they do to complete the job. The repetition of the calculations is helpful for those students challenged in their math skills.

This lab does allow for some creativity and creation as the students construct a patio surface with unit pavers, and then with natural stone. This is one aspect of the landscape construction industry I really enjoy. The fact that not all materials are the same size or shape, thus the variability of products creates another layer of creativity. I was surprised that the

analysis level was covered by the objectives as much as it was, but in looking back through the evaluation, it makes sense because of the use of math problems and the use of different products within the lab.

Table 7. Hardscape Lab evaluation of objectives

Summary of Content	Blooms taxonomic level	Suggested instruction strategies
Define and give examples of hardscapes within the landscape.	Remembering, Understanding, Analysis	**Summarize, Clarify**: From reading text and through watching the videos
Calculate materials needed for different hardscapes in the landscape	Remembering, Understanding, Analysis, Application	**Differentiate, Check, Solve:** Completing industry scenario problems, reading text and through watching the videos
Know different types of materials that can be used in the construction of hardscaping features.	Remembering, Understanding, Analysis	**Summarize, Differentiate, Check, Reflect**: From reading text and through watching the videos
Understand the process of steps involved in the installation of hardscapes.	Remembering, Understanding, Analysis	**Summarize, Differentiate, Reflect**: Through reading text and watching the videos
Demonstrate the steps of preparing the site for installation of hardscape paving.	Application	**Perform:** Using proper tools and techniques to manipulate materials
Demonstrate proper installation of different paving materials	Application	**Perform**: Through manipulation of materials
Understand the steps for installing patio edging.	Remembering, Understanding, Analysis	**Summarize, Clarify**: From reading text and through watching the videos
Demonstrate the steps of installation of hardscape paving.	Application, Creating	**Perform, Create:** Through manipulation of materials
Demonstrate the steps of installation of edging for hardscape paving.	Application	**Perform**: Through manipulation of materials

Flower Garden Design Lab:

This is the first lab students that continue into the Tier 2 Landscape tract curriculum would complete, as Landscape Design is the first unit in this part of the curriculum. While I didn't intend for the lab that covers all the aspects of Bloom's Taxonomy to be the first lab completed in the curriculum, it was the last one I worked on because it was the most encompassing, with it covering all the levels of Bloom's taxonomy. This lab offers the unique aspect of design and creation. With the research aspect corresponding to the analysis level, and covered by all five objectives of the lab, the amount of time allotted for completing this lab is higher than all of the other labs. With many of my students having little, or even no design experience, this lab is the first experience they get in the program. Because landscape design is broad, I tried to bring it down to a simple, small area for them to design, rather than beginning with an entire residential landscape lab. The advantage to using this lab is that the student starts from the bottom level of remembering moving up the hierarchy, covering all levels, all the way to the top level, creating. In the design process the student needs to gather information about the plants, then selecting the plants to be used based on characteristics, ultimately placing them in their design. The questions that are paired with the lab ask them to describe their design to someone else, giving the student an opportunity to reflect and evaluate the work they completed.

Table 8. Flower Design Lab evaluation of objectives

Summary of Content	Blooms taxonomic level	Suggested instruction strategies
Describe the elements and principles in landscape design	Remembering, Understanding, Analysis	**Summarize, Clarify, Differentiate**: From reading text and through watching the videos
Better understand the plant selection process involved in landscape design	Remembering, Understanding, Analysis, Creating	**Differentiate, Identify, Interpret, Infer, Select:** From reading text, through watching the videos, and researching plant information
Apply the elements and principles of landscape design	Application, Analysis	**Perform, Differentiate, Identify, Interpret, Select:** Using proper tools and techniques to manipulate materials
Select plants to be used in a landscape	Remembering, Understanding, Analysis, Creating	**Differentiate, Identify, Interpret, Infer, Select:** From reading text and researching plant information
Create a small landscape design	Remembering, Understanding, Application, Analysis, Evaluation, & Creating	**Summarize, Clarify, Differentiate, Identify, Interpret, Infer, Create, Select, Design, Perform:** Reading text and through watching the videos, researching plant information, and producing a final product

Reflection

When I began teaching for the MDOC in 2012, the horticulture curriculum was already set. However, I saw an opportunity to improve the offerings of the horticulture programs. The program curriculum had been designed for our situation; however, it did not offer any industry certification. I continued to press the issue with our education administrators, to seek out and provide industry certification. Finally, after years of pushing, approval was given to go ahead and pursue outside certification. I was selected to be a part of the curriculum team, along with a couple of other horticulture instructors from around the MDOC. A relationship with our MNLA association had begun and we, the team, began speaking with them on the possibilities of offering their certification to our students. We also spoke with our Department of Agriculture on offering the states pesticide applicators license. Once agreements had been made, the team and I began organizing our curriculum. As we laid out our overall format and structure for how we would be delivering the materials, I began seeing a glaring gap in the amount of physical, hands-on application opportunities. From what I was seeing in the curriculum was: here is the material, the student reads the materials, then student takes a test on the materials, and there is no application. To me this was simply recalling and remembering the knowledge they had read. I knew there was something that needed to be added to allow for application of the knowledge learned.

I had begun pursuing a master's degree right before the curriculum team had been formed. I had chosen to pursue a degree in agricultural education based on my current position within the MDOC and the future possibilities it could provide me. As I got further in the master's program, I saw an opportunity for my creative component to create curriculum pieces that could be paired with our industry certification curricula.

As a team we had selected the MNLA's Certified Green Industry Professional (CGIP) certification as the Tier 2, or advanced portion of our MDOC horticulture programs. Students who would be studying this curriculum would have completed the Tier 1 curriculum and would have chosen to continue their education in our programs. Tier 1 includes an introduction to horticulture and plants, along with containing the pesticide applicator training materials. As the horticulture curriculum team, we formatted this portion of the curriculum by combining aspects of our old curriculum with some new updates and revisions. The two main additions were the use of the MNLA CGIP Core reference manual as the foundation and book for the materials and adding the pesticide training materials as the second half. When a student reached the end of Tier 1, they had the possibility of leaving with and Certified Pesticide Applicators license. This portion of curriculum contained hands-on application labs to enhance the learning experience. When continuing in the program and curriculum to Tier 2, this aspect of the learning experience was missing, and thus my proposal idea was beginning to form.

I began thinking about ways to improve the learning experience by providing application of the techniques and procedure the students would have read. At first, I thought that experimental learning would be a great theory to use for the application of the labs. Some of the citations that I have used come from experiential learning sources, but there is much crossover between learning theories. Getting further into the proposal, it was pointed out that using Blooms Taxonomy might be a good fit for what I was trying to accomplish. Recalling back to my teaching theories class, I read up on the theory and looked at how Bloom would fit with what I wanted to accomplish with the creative component. The more I read, the more confident I felt that this would be a great fit for the application portion of the curriculum. Again, not that I didn't use some experiential learning aspects, but from an overall learning standpoint, I felt Bloom's

Taxonomy was a better fit. In using Bloom's Taxonomy, and from looking at many of revisions to the Taxonomy, there are different levels within the Taxonomy, with each level asking higher level thinking from the students. Thinking on the premise of higher-level thinking, I began looking at how others viewed Blooms Taxonomy. I began to see that most of the curriculum materials we were using for the MDOC horticulture programs were on the basic level of Bloom's Taxonomy.

Was there a way to move our students up in the levels of thinking? The use of the developed labs was meant to accomplish just that, move the student up the levels in the taxonomy. The completed labs were to be proposed additions to the Tier 2 landscape tract curriculum of the MDOC horticulture programs. They aim to move the student from the lower levels of thinking to higher order thinking. Higher order thinking skills go beyond basic memorization of facts (Wolfley, 2014). With these labs, the goal is to help provide the students with the skills and motivation to think more creatively and independently. If this can be accomplished, it is likely that they will be able to be successful in the landscape industry, and much less likely to come back into the penial system. In order to accomplish this, one must look at the learning objectives for the material to be covered. Using Bloom's Taxonomy to aid in setting the learning objectives, it helps prevent broad or vague, un-evaluative objectives (Wolfley, 2014). It forces us to think about and focus on more specific outcomes and objectives. This was very evident to me when receiving feedback on the first round of drafts of the lab. I had never had to think in these terms before. It has given me a new appreciation for what teachers do and are responsible for. I see and realize now why there are people who just develop curriculum.

From a teacher stand point, the lesson plans will provide a uniform delivery to our students based on the objectives. So even if the materials we are using are different at the different locations, the outcomes of the objectives are still the same. From a student standpoint, these labs provide them with job like scenarios and experience where they can apply the knowledge gained through the text and videos provided, giving them a deeper understanding. With the goal of giving them the skills to be successful in the industry and lead a life free of crime.

As I look back from this point, it is amazing to me what I have gained from the pursuit of a master's degree. The thing that stands out the most is being able to connect with my students in providing education that provides them with the proper skills and techniques, along with higher order thinking, that will allow them not only to get a job within the industry but be able to be successful members of this wonderful horticulture industry. After completing the labs and lesson plans, I can say that I think differently now when looking at objectives and what I am trying to accomplish in my program. It also was good for me to go through the process of creating the lesson plan, because up until that point, I had not done anything like this from a teaching standpoint. I had completed a couple of lesson plans as part of my master's degree classes but had not professionally completed any lesson plans. I really gained a new appreciation for them, along with the process of creating them. It has opened my eyes and has changed how I will write labs and tests in the future. It will change how I teach and run my program in the future. The way questions are worded does matter when looking at the corresponding level of thinking.

I am excited about the direction of the horticulture programs within the MDOC. I look forward to being able to work on additional materials for my program as I seek to improve the

program and its delivery to my students. The education I have received has provided a deeper drive to make sure this is accomplished.

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APPENDIX

LESSON PLAN

Module or Course Title: Landscape Maintenance and Landscape Construction

Unit: Lawn Management

Lesson: Lawn Installation
This unit would be used in the Michigan Department of Corrections (MDOC) horticulture programs in the Tier 2 Landscape curriculum. It would be used if the student is studying landscape maintenance in the CGIP Landscape Manager Manual or studying Landscape Construction in the CGIP Landscape Contractor manual. The Lawn Installation Lab would give the student hands-on application of the process one would go through to properly install a lawn from seed and sod. Because of the way the MDOC horticulture programs are structured, the student is responsible for learning the content. The instructor is the facilitator and provides the student with the resources and materials once the student has reached the section in the course.

Educational Goal:

To understand and be able to demonstrate the process of installing a lawn from seed and sod.

Objectives: Student will:

Demonstrate proper tool use and equipment safety practices.
Demonstrate the process of steps in preparing a site for establishing a turfgrass area.
Be able to read a seed label.
Be able to install and establish a turfgrass area using seed.
Be able to install and establish a turfgrass using sod.
Know how to calculate the proper amount of fertilizer and seed needed for the given area.

Resources and References:

Michigan Nursery & Landscape Association. (2010). Michigan Certified Landscape Contractor Reference Manual. Okemos, Michigan: Michigan Nursery & Landscape Association.

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Industry Videos selected by instructor

Supplies and Equipment:

For Students:

Area to establish lawn, to be assigned by instructor.
Scale for weighing/measuring fertilizer and seed
Bucket or container to hold seed and fertilizer while weighing/measuring
Fertilizer or substituted material to simulate fertilizer
Grass Seed or substituted material to simulate grass seed.
Penn Mulch, Straw or substituted mulching material
Rototiller
Garden or Grading Rake
Leaf rake
Broadcast or drop spreader
Small hand spreader
Rolls of sod
Lawn Roller
Water hose
Sprinkler
Watering wand
Tape measure
Clipboard
Scrap paper/Lined Paper
Pen/Pencil
Calculator
Soil probe
Hand trowel
Tray for soil

For instructor:

Area to seed/sod
Pen/Pencil
Clipboard
Grading Rubric
Reference Books-See above List
Computer and projector/TV-for playing videos
Headphones

Estimated Time: Estimated 3.5 hours (2 hours classroom time, 1.5 hours Lab time)

Safety: Student to check all equipment prior to use, making sure tools and equipment are in good working condition prior to beginning lab. Student has been made aware of the hazards of powered machinery. Equipment and tools should be used properly and in a safe manner. Proper personal proactive equipment is used when necessary. Student has completed an entire unit of safety in the Tier 1 curriculum of the horticulture program. Student would have watched videos

pertaining to proper hand tool use and powered equipment operation and use prior to completing this lab.

Teaching Procedures

Interest Approach:

The lab is designed for students to learn the proper process of installing and establishing a lawn area using two different methods of establishment. Using industry videos allows learners to watch the process, rather than just read about it. Thus, better applying the knowledge because they can recall the video showing them the proper steps in the process for the proper installation of a lawn.
Variation can be added to this lab by using the tactics below to enhance the learning experience.

Professional Materials: It may be helpful to set up a box that can be used for the application of this lab. A 10'x10' raised bed, made of 2"x6" boards filled with sand may work very well for the quick application of this lab. The students would level the sand as per site prep instructions, continuing with the establishment procedure upon completion. This would make the sod installation quick and easy, as the sand would likely be below the top edge of the board. Materials may be substituted in the lab to simulate fertilizer or seed, especially when using the box, as you would be reusing the box over and over for completing this lab. However, if you don't have an area designated for this, the lab can be completed in any area, large or small, set by the instructor.

Site Control: Have the students establish a lawn area where a landscape bed has been removed or in an area that needs to be re-graded. This also works for areas where lawn or turf needs to be renovated or re-established because the turf is not growing or performing. If you have a larger area, say a newly installed sidewalk in the facility, have additional students work together on the area. The larger the area, the more students that could be involved in the overall learning experience.

Student Learning Objectives & Strategies:

Using Bloom's Taxonomy of Educational Objective, the goal of the lab is to aid in moving the student from the basic levels, to higher level thinking. For each objective listed below, it shows the level for the corresponding objective according to Bloom's Taxonomy.

Summary of Content	Blooms taxonomic level	Suggested instruction strategies
Demonstrate proper tool use and equipment safety practices.	Remembering, Application, Analysis	**Identify, Check, Operate, Perform:** Through reading text, watching videos, continual application of practices.
Demonstrate the process of steps in preparing a site for establishing a turfgrass area.	Application, Analysis	**Identify, Perform:** Using proper tools and techniques to manipulate materials
Be able to read a seed label.	Remembering, Understanding, Application, Analysis	**Identify, Interpret, Infer:** From reading text, through watching the videos, using materials and completing industry scenario problems
Be able to install and establish a turfgrass area using seed.	Application	**Perform:** Using proper tools and techniques to manipulate materials
Be able to install and establish a turfgrass using sod.	Application	**Perform:** Using proper tools and techniques to manipulate materials
Know how to calculate the proper amount of fertilizer and seed needed for the given area.	Remembering, Understanding, Application	**Identify, Check, Solve:** Completing industry scenario problems, reading text and through watching the videos

Delivery Process:

1. READ: Student will first read from either CGIP Landscape Manager Manual Ch. 8-Lawn Management OR the CGIP Landscape Contractor Manual Ch. 13-Lawn Management. This depends on which tract the student has chosen.
2. WATCH: Student will watch videos on lawn installation and establishment on a large screen or other device in the classroom.
3. DISTIBUTE LAB SHEET & MATERIALS: Following the videos, the student will be given lab sheet.
4. GATHER: Student will gather the materials and equipment needed to complete the lab.
5. ASSIGN: Instructor will assign area to student.
6. COMPLETE: Following the instructions, student will complete the site preparation portion of the lab, making sure to wear PPE when needed and using tools properly. NOTE: Instructor may need to assist/coach student on proper operation of rototiller to proper preparation depth. Student may request soil testing lab for reference. Student would have completed this lab in Tier 1 of the curriculum.

7. GRADE & PROVIDE FEEDBACK: Student will notify the instructor of completion to this point. Instructor will assess and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric. The instructor decides whether student needs to redo any steps or approve moving to the establishment part the lab.
8. COMPLETE: Following the instructions student will complete procedure for establishing a lawn by seed. Making sure to follow all tool and equipment safety protocol.
9. GRADE & PROVIDE FEEDBACK: Student will notify the instructor of completion to this point. Instructor will assess and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric. The instructor decides whether student needs to redo any steps or approve moving to the establishment of lawn area by sod in the same area or a different area assigned.
10. COMPLETE: Following the instructions student will complete procedure for establishing a lawn by sod.
11. GRADE & PROVIDE FEEDBACK: Student will notify the instructor of completion to this point. Instructor will grade and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric.
12. Student will fix any of the issues discussed with instructor.
13. The instructor will check students work again, then once instructor approves, continue to next steps for cleanup and finishing the lab.
14. CLEAN UP: Student will clean up as instructed and return all materials and equipment.
15. COMPLETE: Student will complete questions at the end of the lab.
16. FINAL GRADE & PROVIDE FEEDBACK: Student will turn in completed questions for grading. Instructor will provide feedback over the whole lab and give the final grade based on the grading rubric.

Summary and Review:

The lawn installation lab will give the student hands-on application with the proper process and procedure to properly install and establish a lawn at a job site. This lab can be tied together with Irrigation system installation labs, site grading and drainage, along with landscape installation labs. It draws on student's previous curriculum materials such as soil testing and basic horticulture math. I believe adding a calculations portion to this lab in the future furthers the depth of knowledge and practice for the student, thus enhancing their knowledge.

Based on the structure and format of the MDOC horticulture program, Student may need to work with a tutor to further the students understanding of the proper process in establishing new lawn areas.

Evaluation:

Use the grading rubrics below the instructor will watch student to verify process is being followed correctly. Student will receive points for the items completed correctly. Student must get 80% to pass the lab. Student will need to work with a tutor prior to trying the lab again.

Grading Rubric:

Description	High Performing	Medium Performing	Low Performing	Total Points
Site Preparation	Area smoothly leveled to finished grade with no debris or stones in the area with proper amount of fertilizer even spread over area 10 points	Area smoothly leveled, a few depressions or divots, some debris or stones in the area, proper amount of fertilizer evenly spread over area 6 points	Area not smoothly leveled, many depressions or divots, debris or stones in the area, fertilizer not evenly spread over area 1 point	**____/10**
Establishment by seed	Proper amount of seed, evenly spread over area, properly raked and rolled ensuring soil/seed contact 10 points	Proper amount of seed but evenly spread over area, unevenly raked or spots not rolled 6 points	Didn't use proper seed amount and unevenly spread over area, not raked or rolled 1 point	**____/10**
Establishment by Sod	All seems and edges tightly fit together, installed at proper grade 10 points	Majority of seems tightly fit together, a few seems not tightly fit, parts at proper grade 6 points	Seems loose, with visual gaps between pieces, not laid in brick pattern, not installed at proper grade 1 point	**____/10**
Clean up	All equipment and materials are placed back in proper locations 5 points	Tools and equipment may be put away and cleaned up but are not put away in proper locations 3 points	Tools are equipment are not cleaned up and put away 0 points	**____/5**
Safety	Student uses tools properly and wears PPE when necessary 5 points	Student may use tools properly but does use PPE when necessary 3 points	Student does not use tool properly and does not wear PPE 1 point	**___/5**
Questions	All work is written out neat and organized and easy to follow with correct answers 10 points	Work is semi organized but may be difficult to follow with some correct answers 6 points	Work is written out poorly, not in complete sentences with incorrect answers 2 points	**___/10**
TOTAL:				**____/50**

Lawn Installation Lab

Prior to beginning this lab, you will need to have the instructor give you the equipment required, along with assigning the area to be used.
You will work alone on this project, unless the instructor tells you to work in teams or pairs.

Equipment and materials:

Area to establish lawn. (assigned by instructor)
Scale for weighing/measuring fertilizer and seed
Bucket or container to hold seed and fertilizer while weighing/measuring
Fertilizer or substituted material to simulate fertilizer
Grass Seed or substituted material to simulate grass seed.
Penn Mulch, Straw or substituted mulching material

Rototiller
Garden or Grading Rake
Leaf rake
Broadcast or drop spreader
Small hand spreader
Rolls of sod
Lawn Roller
Water hose
Sprinkler
Watering wand
Tape measure
Clipboard
Scrap paper/Lined Paper
Pen/Pencil
Calculator
Soil probe
Hand trowel
Tray for soil

Safety:

You will need to check all equipment prior to use, making sure each piece of equipment is in good working condition prior to use. Equipment and tools should be used properly and in a safe manner. Proper personal proactive equipment should be used when necessary.

Procedure:

Once you have been assigned the designated area, follow the steps below.

Site Preparations:

1. Using a tape measure, measure the length and width of the area to bed prepped in feet, writing the measurements down on paper.
2. Calculate total area in square footage to be prepped. Area (sq. ft.) =Length(ft.) × Width(ft.)

3. Make a quick assessment of the site for any hazards, removing any hazards prior to continuing.
4. Check rototiller's fuel and oil levels. Check to make sure there are no rocks or debris in the tines prior to operation.
5. Prepare the area by rototilling the entire area to a depth of 6".
   NOTE: Seek out assistance/coaching to make sure you are operating machine at proper depth.
6. Collect soil samples using soil probe or a hand trowel from the area. Placing the samples on a tray in the classroom to dry out to be tested later.
   NOTE: Refer to soil testing lab if need be. If you do not have it, request a copy from the instructor.
7. Level the area with a landscape/garden rake, removing any stones or debris from soil surface and fine level at finished landscape grade.
8. Using the measurements, determine amount of fertilizer to be used from fertilizer label. Instructor will give you the rate if using substituted material.
9. Weigh out fertilizer at recommended weight for area. Making sure to put on PPE prior to handling fertilizer.
10. Place fertilizer in spreader and apply fertilizer over area.
    STOP: Ask your instructor to check your work.
    The instructor will check your work, give feedback and may ask you to fix any of the issues discussed before continuing with the lab. Once approved, continue with instructor assigned establishment method.

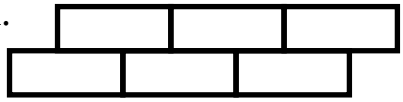
Establishment by Seed:

1. Using the measurements of the area, determine amount of seed to be used for the area from grass seed label. Instructor will give you the rate if using substituted material.
2. Weigh out proper amount of grass seed for area.
3. Placing grass seed in the spreader and spread seed over finished graded area.
4. Using the backside of a leaf rake, rake the soil to allow contact of the soil with the seed. Going in one direction first, the again 90° from your first direction.
5. Roll seeded area with roller.
6. Apply Penn mulch or substituted mulch material to seeded area to help retain moisture.

7. Set up water hose and thoroughly water newly seeded area. Watering regularly each day until well established.
   STOP: Ask your instructor to check your work.
   The instructor will check your work, give feedback and may ask you to fix any of the issues discussed before continuing with the lab.
   NOTE: Instructor may have you continue with establishment by sod procedure over the same area, or you may be assigned a new area, repeating the site preparation steps.

Establishment by Sod:

1. If assigned a new area, follow Site Preparation procedure before proceeding to next step. Otherwise continue with step 2.
2. After completing the steps for site preparation, lay sod over selected area, in an interlocking pattern, such as the diagram below, beginning along the longest edge of the area.



3. Complete sodding of entire area, making sure that all seems are fit tightly together.
4. Roll the sodded area, as this insures good soil contact of the seams and roots to the soil.
5. Set up water hose and thoroughly water newly seeded area. Watering regularly each day until well established.
   STOP: Ask your instructor to check your work.
   The instructor will check your work, give feedback and may ask you to fix any of the issues discussed before continuing with the lab. If satisfactorily completed, move to clean up

Clean up:

1. Clean up tools and equipment, placing them in their proper location.
2. Instructor may have you roll sod back up, so other students can use it for the lab.
3. Answer the questions at the end of the lab.

Questions:

Complete the following questions in your own words. Turn them into the instructor upon completion for grading

1. Explain what would happen if you skipped a step or set of steps in establishing a new lawn area.

2. Explain the purpose of rolling a newly seeded area of grass seed or newly laid sod.

3. Why is it important to follow recommended rates of fertilizer? Would this be the same for rates of grass seed?

4. Before operating and piece of equipment or using a tool, explain what should be completed prior to use?

5. If you were going to install a new lawn area, what method of establishment would you choose? Give at least 3 reasons why you would choose to use this method.

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2019

STATE OF MICHIGAN
DEPARTMENT OF CORRECTIONS
LANSING

LESSON PLAN

Module or Course Title: Landscape Maintenance and Landscape Construction

Unit: Irrigation

Lesson: Irrigation Controller

This unit would be used in the Michigan Department of Corrections (MDOC) horticulture programs in the Tier 2 Landscape curriculum. It would be used if the student is studying landscape maintenance in the CGIP Landscape Manager Manual or studying Landscape Construction in the CGIP Landscape Contractor manual. The Irrigation Controller Lab would give the student hands-on application with programing an irrigation controller that might be installed at a job site they may work on. Because of the way the MDOC horticulture programs are structured, student is responsible for learning the content. The instructor is the facilitator and provides the student with the resources and materials once the student has reached the section in the course.

Educational Goal:

To define what an Irrigation controller is and be able to properly execute the set up and programming of an Irrigation controller.

Objectives: Student will:

Connect power source and turn on an irrigation controller
Set time and date of an irrigation controller.
Set irrigation zone run times.
Be able set start times for single and multiple irrigation programs.
Be able to manually start irrigation zones.
Be able to describe the capabilities and functions of an irrigation controller.
Make sure power cord is connected properly prior to plugging it into power source.
Explain effects of incorrect programming as it pertains to the landscape.

Resources and References:

Michigan Nursery & Landscape Association. (2010). Michigan Certified Landscape Contractor Reference Manual. Okemos, Michigan: Michigan Nursery & Landscape Association.

Michigan Nursery and Landscape Association. (2010). Michigan Certified Landscape Manager Reference Manual. Okemos, Michigan: Michigan Nursery & Landscape Association.

PLANET. (2011). Landscape Training Manual for Irrigation Technicians. Herndon, Virginia: Professional Landcare Network.

Sauter, D. (2011). Landscape Construction (3rd ed.). Clifton Park, New York: Delmar, Cengage Learning.

Industry Videos selected by instructor: suggested videos linked below

Hunter Pro-C Video Retrieved from youtube.com

Additional Hunter Pro-C Video Retrieved from youtube.com

Supplies and Equipment:

For Students:

Irrigation clock with power cord and Owner's Manual (Hunter Pro-C with 12 zones)
Additional irrigation clocks of different manufactures (optional)
Irrigation Controller Lab Sheet
Pen/Pencil
Small Screwdriver (Philips or Standard)
Clipboard

For instructor:

Pen/Pencil
Clipboard
Grading Rubric
Reference Books-See above List
Computer and projector/TV-for playing videos
Headphones

Estimated Time: Estimated 3.5 hours (2 hours classroom time, 1.5 hours lab time)

Safety: The student will install the power cord prior to plugging it into to power source so they are not working with live electricity. This should be done under the supervision of a classroom tutor or instructor.

Teaching Procedures

Interest Approach:

The lab uses professional landscape job site situations to enhance the transfer of learning process. The instructor or designated tutor should reset the irrigation controller initially prior to students beginning the lab activity. Variation can be added to this lab by using the tactics below to enhance the learning experience.

Role Play: Have another student or tutor act as the homeowner and ask questions while the student is programing the controller.

Site Control: Have the students program the controller that runs the irrigation at your facility and have them test a real zone that they can see running.

Professional Materials: By using industry videos they can feel confident they can apply the knowledge when the time comes because they can recall the video showing them the process.

Equipment Variation: In the industry there are different types of irrigation controllers. It may be helpful to have two or more different brands of irrigation clocks for the students to use. Having them complete the lab with one clock, then using a different manufactures clock to complete the same tasks. This way they would become familiar with more than one product, as not all companies' controllers are the exact same, thus giving the students a larger knowledge base and better preparing them for products used on different job

sites. Having different students do the lab with different controllers, then have them discuss the differences between the products.

Student Learning Objectives & Strategies:

Using Bloom's Taxonomy of Educational Objective, the goal of the lab is to aid in moving the student from the basic levels, to higher level thinking. For each objective listed below, it shows the level for the corresponding objective according to Bloom's Taxonomy.

Summary of Objectives	Blooms taxonomic level	Suggested instruction strategies
Be able to describe the capabilities and function of an irrigation controller.	Remembering, Understanding, Analysis	**Summarize, Clarify**: From reading text and owner's/operator's manuals and through watching the videos
Be able to set time and date of an irrigation controller.	Application	**Perform**: Physical manipulation of equipment
Set time and date of an irrigation controller.	Application	**Perform**: Physical manipulation of equipment
Be able to program irrigation zone run times.	Application	**Perform**: Physical manipulation of equipment
Be able set start times for single and multiple irrigation programs.	Application	**Perform**: Physical manipulation of equipment
Be able to manually start any irrigation zone.	Application	**Perform**: Physical manipulation of equipment
Explain effects of incorrect programming as it pertains to the landscape.	Remembering, Understanding, Analysis, Evaluation	**Summarize, Differentiate, Check, Reflect**: From reading text and owner's/operator's manuals and through watching the videos

Delivery Sequence:

1. READ: Students read from either CGIP Landscape Manager Manual Ch. 8-Lawn Management & Ch. 12 Water Use and Efficient Irrigation OR the CGIP Landscape Contractor Manual Ch. 9 Water Use and Efficient Irrigation & Ch. 13-Lawn Management.
2. WATCH: Student will watch videos on programming an Irrigation controller on a large screen or other device in the classroom.
3. DISTIBUTE LAB SHEET & MATERIALS: Following the videos, the student will be given the Irrigation Lab Part I: Irrigation Time Clock Programing sheet and the lab materials. This would include the owner's manual of the irrigation clock being used.

4. READ: Student should read the owner's/operation manual of the irrigation clock being used as part of the lab procedures.
5. Student will then complete the procedure set forth by the lab and answering the questions at the end of the lab. Students will notify instructor when completed.
6. GRADE & PROVIDE FEEDBACK: Instructor will grade activity and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric. The instructor decides whether student needs to redo the lab or approve moving to part 2 of the Lab.
7. Student Completes Part 2 Following same procedure as Part I or the lab.

Summary and Review:

Based on the structure and format of the MDOC horticulture program, feedback will be given to the student from the instructor when verifying the Controller programming with the grading rubric. Student may need to work with a tutor to further the students understanding and performance of the proper process to program the irrigation controller.

Evaluation:

Use the grading rubrics below the instructor will check to verify programing of the controller to the specifications set and that the student demonstrates how to manually activate any zone to the instructor. Student will receive points for the items completed correctly. Student must get 80% to pass the lab. Student will need to work with a tutor prior to trying the lab again.

GRADING RUBRICS:

Part 1: Grading Rubric Description	**High Performing**	**Medium Performing**	**Low Performing**	**Total Points**
Controller Setup	Date and time are set correctly, no errors 2 points	Date and time set, but not per instructions 1 point	Date and time not set 0 points	**___/2**
Controller Programming	All zones and cycle times programed correctly and exactly as instructions state 15 points	Most zones and cycle times programmed correctly or vary slightly from instructions 7.5 points	A few zones or cycle times may be correct, while the majority are not correct according to the instructions 3 points	**___/15**
Manual Zone Activation	Demonstrates in single step without looking at instructions 3 points	Demonstrates proper step after looking at instructions 2 points	Demonstrates with assistance from instructions 1 point	**___/3**
Questions	Well-articulated and concise answers, in complete sentences 5 points	Answers may be correct but not concise or in complete sentences 3 points	Incomplete sentences or incorrect answers 1 point	**___/5**
Safety	Aware of safety and follows protocol 5 points	Aware of safety and but misses steps in protocol 3 points	Unaware of Safety and doesn't follow protocol 1 point	**___/5**
TOTAL POINTS				**___/25**

Part 2: **Grading Rubric Description**	**High Performing**	**Medium Performing**	**Low Performing**	**Points**
Controller Setup	Date and time are set correctly, no errors 2 points	Date and time set, but not per instructions 1 point	Date and time not set 0 points	**___/2**
Controller Programming	All zones and cycle times programed correctly and exactly as instructions state 40 points	The majority of zones and cycle times programmed correctly or vary slightly from instructions 25 points	A few zones or cycle times may be correct, while the majority are not correct according to the instructions 10 points	**___/40**
Manual Zone Activation	Demonstrates in single step without looking at instructions 3 points	Demonstrates proper step after looking at instructions 2 points	Demonstrates with assistance from instructions 1 point	**___/3**
Questions	Well-articulated and concise answers, in complete sentences 10 points	Answers may be correct but not concise or in complete sentences 6 points	Incomplete sentences or incorrect answers 3 points	**___/10**
Safety	Aware of and follows safety protocol 5 points	Aware of safety and but doesn't follow protocol 3 points	Unaware of Safety and doesn't follow protocol 1 point	**___/5**
TOTAL POINTS				**___/55**

Irrigation Lab:

Part 1- Irrigation Time Clock Programming

Prior to beginning this lab, you will need to have the instructor give you the equipment required.
You will work alone on this project, unless the instructor tells you to work in teams.

Equipment Needed:

Owner's manual for irrigation clock to be used
Irrigation clock with power cord (Hunter Pro-C with 12 zones)
Small screwdriver
Pen/Pencil

Job Situation:

You have arrived at a job site (customers home) to install the irrigation controller for the irrigation system that your company had just installed. Power up the Irrigation controller and program it based on the instructions below. If you have questions, refer to your notes and the owner's manual. Feel free to ask the instructor for assistance if needed.

Safety:

You will install the power cord prior to plugging it into to power source, following the owner's manual instructions. This should be done under the supervision of a classroom tutor or the instructor. If installed correctly, irrigation controller display screen will display flashing time.

Procedures:

1. Read through owner's manual of the irrigation clock.
2. Install power cord to Irrigation controller as per owner's manual instructions.
3. Plug in power cord to electrical outlet.

Programming of irrigation clock:

4. Set current day
5. Set current time-A.M./P.M. setting, not 24 hour setting
6. Program A:
    - Start time of 3:30 A.M.
    - All zones to be watered Monday, Wednesday, and Friday.

- Station (zone) 1: Turf area with rotors in partial shade
  Watering run time to be 30 minutes
- Station (zone) 2: Turf area with rotors in partial shade
  Watering run time to be 20 minutes
- Station (zone) 3: Pop-up spray heads in a landscape bed
  Watering time to be 40 minutes
- Station (zone) 4: Garden area with rotors in full sun
  Watering time to be 45 minutes
- Station (zone) 5: Garden area with rotors in full sun
  Watering time to be 45 minutes
- Station (zone) 6: Turf area with rotors in partial shade
  Watering run time to be 20 minutes
- All other stations (zones) 7-12: 0 minutes runtime (Off)

7. Program B: Off
8. Program C: Off

Once you finish programing the irrigation controller, manually activate zone 4.

Write answers to the following questions, in your own words. Answers should be written in complete sentences.

1. What does the irrigation controller "do"? What is the function of an irrigation controller?

2. If you needed help programming the controller, where would you look for help or assistance? Where can you find assistance with programming instructions?

3. How would you make sure all the zones are programmed correctly? What steps would you take to make sure all of the zones are correctly programmed?

4. If there was a mistake in programming, what impact would the mistake have on the lawn or landscape? How would you fix the programming?

Bring this paper to your instructor. Ask the instructor to check your programing. The instructor may ask you to manually start a zone of the instructors choosing. The instructor may give feedback and may ask you to repeat aspects of the lab for practice.

Irrigation Lab Part 2: Advanced Irrigation Time Clock Programming

Work Situation:

You received a call from a homeowner, regarding their irrigation system that your company installed. The homeowner claims the zones don't come on properly and informs you that he has changed some of the programming. He is asking if you can fix the problems and reset it to the way it was on installation. You inform him that you will be out to check it the next day. You arrive at the job site to find the homeowner has changed the watering zone times and program start times on the irrigation controller for the system like he said. Your task is to program the controller as it was when it was initially installed.

Procedure:

1. Make sure irrigation clock is plugged into power source
2. Reset Irrigation Time clock
3. Set current day
4. Set current time
5. Begin setting Program A:
   - Cycle Start time of 1:30 A.M.
   - Zones to be watered Monday, Wednesday, and Friday.
   - Station (zone) 1: Turf area with Rotors in partial shade
     Watering run time to be 35 minutes
   - Station (zone) 2: Turf area with Rotors in partial shade
     Watering run time to be 35 minutes
   - Station (zone) 3: Pop-up Spray heads in a landscape bed – Off
   - Station (zone) 4: Garden area with rotors in full sun – Off
   - Station (zone) 5: Garden area with rotors in full sun – Off
   - Station (zone) 6: Turf area with Rotors in partial shade
     Watering run time to be 20 minutes
   - Stations (zones) 7: Pop-up mini rotors (R-Van)
     Watering time 20 minutes
   - Stations (zones) 8: Pop-up Spray heads in a landscape bed – Off
   - Stations (zones) 9: Turf area with Rotors in partial shade
     Watering run time to be 20 minutes
   - Stations (zones) 10: Drip zone – Off
   - Stations (zones) 11: Turf area with Rotors in partial shade
     Watering run time to be 25 minutes

- Stations (zones) 12: Off

6. Program B:
   - Cycle start time of 5:00 A.M.
   - Zones to be watered Tuesday, Thursday, and Saturday
   - Station (zone) 1: Turf area with Rotors in partial shade – Off
   - Station (zone) 2: Turf area with Rotors in partial shade – Off
   - Station (zone) 3: Pop-up Spray heads in a landscape bed – 15 minutes
   - Station (zone) 4: Garden area with rotors in full sun – 45 min
   - Station (zone) 5: Garden area with rotors in full sun – 45 min
   - Station (zone) 6: Turf area with Rotors in partial shade – Off
   - Stations (zones) 7: Pop-up mini rotors (R-Van) – Off
   - Stations (zones) 8: Pop-up Spray heads in a landscape bed – Off
   - Stations (zones) 9: Turf area with Rotors in partial shade – Off
   - Stations (zones) 10: Drip zone – Off
   - Stations (zones) 11: Turf area with Rotors in partial shade – Off
   - Stations (zones) 12: Off

7. Program C:
   - Cycle start time of 12:00pm
   - Zones to be watered every other day.
   - Set station (zone) 10: Drip Zone – 2 hours
   - All other stations (zones): Off

Once you finish programing the irrigation controller, manually activate one zone from each program.

Write answers to the following questions, in your own words. Answers should be written in complete sentences.

1. What's the purpose of having multiple programs in the Irrigation controller?

2. How many times may an individual program be set to run? (based on the clock used)

3. What is the minimum time a zone may run for? What is the maximum time a zone may run for? What is the increment of time used for zone timing? Do these numbers have any significance in programming? (based on the clock used)

4. When would you use the reset button? What do you think would be a situation that would require using the reset button on the controller?

5. Why is it important to know the type of irrigation a zone would be controlling prior to programming the Controller?

Bring this paper to your instructor. Ask the instructor to check your programing. The instructor may ask you to manually start a zone of the instructors choosing. The instructor may give feedback and may ask you to repeat aspects of the lab for practice.

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STATE OF MICHIGAN
DEPARTMENT OF CORRECTIONS
LANSING

LESSON PLAN

Module or Course Title: Landscape Construction

Unit: Hardscaping

Lesson: Hardscape Installation
This unit would be used in the Michigan Department of Corrections (MDOC) horticulture programs in the Tier 2 Landscape curriculum. It would be used if the student is studying Landscape Construction. This lab is broken down into multiple parts and gives the student practice in hands-on application of the process one would go through to properly install hardscape feature on a job site. It also gives the student experience with calculating the materials needed to install hardscapes in the landscape. Because of the way the MDOC horticulture programs are structured, student is responsible for learning the content of the unit. The instructor is the facilitator and provides the student with the resources and materials once the student has reached the corresponding section in the course.

Educational Goal:

Student will be able to describe and follow the proper procedure for installing different hardscapes (patios, walkways, driveways, & retaining walls) in the landscape.

Objectives: Student will:

Define and give examples of hardscapes within the landscape.
Calculate materials needed for different hardscapes in the landscape (patios, walkways, driveways, & retaining walls)
Know different types of materials that can be used in the construction of hardscaping features.
Understand the process of steps involved in the installation of hardscapes (walkways, patios, driveways, & retaining walls).
Demonstrate the steps of preparing the site for installation of hardscape paving.
Demonstrate proper installation of different paving materials
Understand the steps for installing patio edging.
Demonstrate the steps of installation of hardscape paving.
Demonstrate the steps of installation of edging for hardscape paving.

Resources and References:

Michigan Nursery & Landscape Association. (2010). Michigan Certified Landscape Contractor Reference Manual. Okemos, Michigan: Michigan Nursery & Landscape Association.
Sauter, D. (2011). Landscape Construction (3rd ed.). Clifton Park, New York: Delmar, Cengage Learning.
PLANET. (2011). Landscape Training Manual for Installation Technicians. Herndon, Virginia: Professional Landcare Network.
Ingels, J.E. (2009). Landscaping: Principles and Practices (7th ed.). Clifton Park, New York: Delmar, Cengage Learning.
Industry Videos selected by instructor

Supplies and Equipment:

For Students:

Calculator
Various Patio paving materials-different unit pavers and natural flagstone
Various retaining Wall block-segmental concrete blocks and landscape timbers
Dead blow hammer/Rubber mallet
21AA or crushed concrete for base material
Clean sand for setting bed
Landscape fabric pieces
Patio edging w/ spikes
Broom
Tamper/Compactor
1" Screed rails
2"x4" Screed board
Hand Trowel
Small hand level
Garden rake
Contractor's level
Personal Protective Equipment-Gloves, safety glasses, ear plugs/muffs (if using power equipment)

For instructor:

Area to setup patio/wall
Pen/Pencil
Clipboard
Grading Rubric
Reference Books-See above List
Computer and projector/TV-for playing videos
Headphones

Estimated Time: Estimated 10 hours (7.5 hours classroom time, 2.5 hours lab time)

Safety: Student to check all equipment prior to use, making sure they are in good working condition prior to beginning lab. Student should be aware of the hazards of powered machinery (if using powered compactor). Equipment and tools should be used properly and in a safe manner. Proper personal proactive equipment is used when necessary. Student has had an entire unit of safety in the Tier 1 curriculum of the horticulture program. Student would have watched videos pertaining to proper equipment operation and use prior to completing this lab.

Teaching Procedures

Interest Approach:

The lab is designed in parts so that students learn the proper procedure of installing hardscape paving in the landscape along with the calculating the necessary materials needed for installation. This lab ties together with site grading and drainage, along with Contractors level lab and slope calculations. It may be helpful to use the image in the lab of paver installation in a PowerPoint presentation or as a printed color photo. Showing it from the computer onto a projector or TV with the videos would be advised as well. In the MDOC we do not have color printers, so it may not look as good in black and white. Showing it on a large scale may help the student better understand exactly how it should be installed.

Variation can be added to this lab by using the tactics below to enhance the learning experience.

Site Control: If you have an area that needs a sidewalk, have the student install it using pavers or flagstone; this would be a permanent structure, as it would be on a job site.

Professional Materials: For the hands-on portions of the lab (parts 3&4), it is advised to have designated area used for the application of this lab. A 10'x10' raised bed made of 2"x6" boards, partially filled with sand would be ideal. This way the student can fully complete the simulated construction. However, if you don't have this or the capability of building one, the lab can be completed in any area set by the instructor. The use of different industry videos, especially videos showing the process for the proper installation of a patio or retaining walls, helps students gain additional knowledge and feel confident they can apply the knowledge learned. Videos showing different pavers, types of stone products, would be helpful as well.

Student Learning Objectives & Strategies:

Using Bloom's Taxonomy of Educational Objective, the goal of the lab is to aid in moving the student from the basic levels, to higher level thinking. For each objective listed below, it shows the level for the corresponding objective according to Bloom's Taxonomy.

Summary of Content	Blooms taxonomic level	Suggested instruction strategies
Define and give examples of hardscapes within the landscape.	Remembering, Understanding, Analysis	**Summarize, Clarify**: From reading text and through watching the videos
Calculate materials needed for different hardscapes in the landscape	Remembering, Understanding, Analysis, Application	**Differentiate, Check, Solve:** Completing industry scenario problems, reading text and through watching the videos
Know different types of materials that can be used in the construction of hardscaping features.	Remembering, Understanding, Analysis	**Summarize, Differentiate, Check, Reflect**: From reading text and through watching the videos
Understand the process of steps involved in the installation of hardscapes.	Remembering, Understanding, Analysis	**Summarize, Differentiate, Reflect**: Through reading text and watching the videos
Demonstrate the steps of preparing the site for installation of hardscape paving.	Application	**Perform:** Using proper tools and techniques to manipulate materials
Demonstrate proper installation of different paving materials	Application	**Perform**: Through manipulation of materials
Understand the steps for installing patio edging.	Remembering, Understanding, Analysis	**Summarize, Clarify**: From reading text and through watching the videos
Demonstrate the steps of installation of hardscape paving.	Application, Creating	**Perform, Create:** Through manipulation of materials
Demonstrate the steps of installation of edging for hardscape paving.	Application	**Perform**: Through manipulation of materials

Delivery Process:

1. READ: Student will read from the CGIP Landscape Contractor Manual Ch.8 Landscape Construction, pgs. 81-98.
2. ADDITIONAL READING: Student will read from Landscape Construction text book, Ch. 16-27, pgs. 213-352 covering landscape retaining walls and landscape

paving. The initial reading is brief, and this text provides more in-depth coverage on hardscaping specifically.

3. WATCH: Student will watch videos on hardscape installation on a large screen or other device in the classroom.
4. DISTIBUTE LAB SHEET & MATERIALS: Following the videos, the student will be given part 1 of the Hardscaping lab.
5. COMPLETE: Following the instructions for Part 1, student will complete the calculation problems.
6. GRADE & PROVIDE FEEDBACK: Instructor will grade part 1 and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric. The instructor decides whether student needs to redo the problems or do additional problems or approve moving to part 2 of the Lab.
7. DISTIBUTE LAB SHEET & MATERIALS: Following the videos, the student will be given part 2 of the Hardscaping lab.
8. COMPLETE: Following the instructions for Part 2, student will complete the calculation problems.
9. GRADE & PROVIDE FEEDBACK: Instructor will grade part 2 and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric. The instructor decides whether student needs to redo the problems or do additional problems or approve moving to part 3 of the Lab.
10. DISTIBUTE LAB SHEET: The student will be given part 3 of the Hardscaping lab.
11. READ: Student will read through needed materials and procedures.
12. GATHER: Student will gather the materials and equipment needed to complete part 3 of the lab.
13. COMPLETE: Following the instructions for Part 3, student will complete the steps of initial site preparation and install a small patio using pavers.
14. Student will notify the instructor of completion to this point. The instructor may give feedback and ask you fix any of the issues discussed with instructor or repeat aspects of the lab for practice. Then once instructor approves, continue to next steps.
15. COMPLETE: Following the instructions, student will follow lab instructions, removing the pavers and install a small patio using natural stone pieces.
16. Student will notify the instructor of completion to this point. The instructor may give feedback and may ask you to fix any of the issues discussed or repeat aspects of the lab for practice. Then once instructor approves, continue to next steps for Cleanup.
17. CLEAN UP: Student will clean up as instructed and return all materials and equipment.
18. GRADE & PROVIDE FEEDBACK: Instructor will grade part 3 and provide feedback to address performance that doesn't meet satisfactory completion based on the grading rubric. The instructor decides whether student needs to redo part 3 of the lab or move on to part 4 Retaining wall installation (TBD)
19. Instructor may assign additional reading material from the other resources, such as Landscaping: Practices and Principles, Ch. 11, prior to the student completing part 3 of the lab again.

Summary and Review:

Based on the structure and format of the MDOC horticulture program, feedback will be given to the student from the tutors on the calculation parts of the lab (parts 1&2), as the tutors would be grading and assisting the student, if needed, as he completes the calculations. The Instructor would be involved in Parts 3 &4 of the lab, verifying the process of installation is done correctly using the grading rubric. Student may need to work with a tutor to further the students understanding of the proper process in installing different hardscape features.

Evaluation:

Use the grading rubrics below the instructor will watch student to verify process is being followed correctly. Student will receive points for the items completed correctly. Student must get 80% to pass the lab. Student will need to work with a tutor prior to trying the lab again.

Grading Rubrics:

Part 1& 2: Calculations	**High Performing**	**Medium Performing**	**Low Performing**	**Points**
Calculations	All work is written out neat and organized and easy to follow with correct answers and correct units	Work is semi organized and may be difficult to follow with some correct answers and some correct units	Work is written out poorly and with incorrect answers and in correct units	**5 total points for each question**
Part 1 **Problem 1** **Problem 2** **Problem 3** **Problem 4** **Problem 5**	5 points	3 points	1 point	**___/5** **___/5** **___/5** **___/5** **___/5** **Total: __/25**
Part 2 **Problem 1** **Problem 2**	10 points	5 points	1 point	**___/10** **___/10** **Total: __/20**
				Total:___/30

Part 3: Patio Installation	**High Performing**	**Medium Performing**	**Low Performing**	**Total Points**
Initial Site preparation: **Base Material** **Sand layer**	Well compacted Base material is at proper depth uniformly over the area, being tamped between lifts. 5 points Sand layer is smooth and free of debris and is a uniform 1" depth over the area 5 points	Base material may be well compacted in certain areas, may be at proper depth but not over the entire area, tamped between lifts. 3 points Sand layer has some divots but for the most part is smooth and 1" depth over the area 3 Points	Base material is not at proper depth, is uneven, and has not been compacted well and is loose. 1 point Sand layer is not smooth and not uniform 1" depth over the area 1 point	**___/5** **___/5**
Paver Installation	Pavers are closely fit together and are level, pattern is uniform throughout 5 points	Pavers may have a few gaps between them, not closely fit together, close to level, loosely patterned 3 points	Pavers are not tightly fit together and have large gaps between them and not level, no pattern 1 point	**___/5**
Natural Stone Installation	Stones have uniform spacing and are all level 5 points	Stones may have close to uniform spacing with a few larger gaps, some stones are unlevel 3 points	Unlevel stones and not uniformly spaced with large gaps between pieces of stone 1 point	**___/5**
Edging Installation	Installed on base material, not sand. Tightly fit to the pavers 5 points	Installed on base material, not sand. Slightly loose from the pavers 3 points	Installed on sand layer and loose from the pavers 1 point	**___/5**
Clean Up	All equipment and materials are placed back in proper locations 5 points	Tools and equipment may be put away and cleaned up but are not put away in proper locations 3 points	Tools are equipment are not cleaned up and put away 0 points	**___/5**
Safety:	Student uses tools properly and wears PPE when necessary 5 points	Student may use tools properly but does use PPE when necessary 3 points	Student does not use tool properly and does not wear PPE 1 point	**___/5**
TOTALS				**___/35**

Hardscape Installation Lab

Part 1- Patio, Walkway, Driveway, and Retaining Wall Base Calculations

When building patios and retaining walls in the landscape, it is important to know how to calculate the needed materials for the job you are working on. You will complete this portion of the lab by yourself.
You will be provided a calculator.

Patios, Walkways, and Driveways:

The rule for base material needed for a patio, walkway, or driveway is based on site conditions. For a patio or walkway, light trafficked, normal base depth is 4"-6". Driveways, or higher trafficked areas, would require 6"-8+". **The minimum base depth is 4".**

Base material calculation formula for patios, walkways, and Driveways:

Sq. ft. of paved Area (L+1' x W+1') × depth of base in inches ÷ 12"= cubic ft. of base material needed.

Cubic ft. of base material needed ÷ 27cu.ft./yd. = cubic yards of base material.

Cubic yards of base material × 1.25(compaction factor) = cu. yards of base material needed

In some cases, you may need the base material weight in tons when purchasing. For base course material the conversion factor is 1.25 tons per cubic yard.

cu. yards of material needed × 1.25 ton/cu. Yard = Tons of material needed

Sand/Bedding Layer calculation formula for patios:

Sq. ft. of Area (Length x Width) x depth of sand (inches) ÷12"= cubic ft. of sand needed.

Cubic ft. of sand needed ÷ 27cu.ft./yd. = cubic yards of sand.

To convert cubic yards of sand to tons, the conversion is 1.5 tons/cubic yard.

Cubic yards of sand × 1.5 ton/cu. yard = tons of sand needed

Example problem:

The landscape drawing shows a 40’(L) x 20’(W) patio is to be built in the landscape:

Base Material:

Length = 40’+ 6” extra on each side=40’ + 1’ = 41’

Width = 20’+ 6” extra on each side=20’ + 1’ = 21’

41’ × 21’ = 861 sq. ft.

861 sq. ft. x 4” ÷ 12” = 287 cu. ft. base needed

287 cu. ft. ÷ 27 cu ft. = 10.63 cubic yards need before compaction

10.63 cu. yards ×1.25 (compaction factor) =13.3 cubic yards base needed

Rounding: Most bulk materials are purchased by the cu. yard, rounding to the nearest 0.25 of a cu. yard is acceptable.

Rounded it is ≈13.5 cu. yards base material needed for patio

13.3 cu. Yards × 1.25 tons/cub. yard =16.625 tons or 16.63 tons of material needed

Sand/Bedding layer:

40’ × 20’ = 800 sq. ft.

800 sq. ft. x 1” ÷ 12” =66.66 cubic ft. Sand

66.66 cu. ft. ÷27 cu. ft.= 2.46 cu. yards sand or ≈2.5 cu yards

2.46 cu. yards × 1.5 ton/cu. yard=3.70 tons sand

Retaining Walls:

The rule for base material needed for a wall is that for every foot of height, an inch of base should be installed. The minimum is 4” of base. (A 2’ tall wall requires 2” base, however minimum is 4”) The width of base should be 12” or 1’ wider than the width of wall material. There is no sand layer for retaining walls as blocks or timbers are placed directly on base material at lowest point of the wall.

Base material Calculation formula for wall:

Length of wall × Wall material width + 12”(or 1’) × depth of base in inches ÷ 12”= cubic ft. of base material

Cubic ft. of base material ÷ 27cu.ft./yd. = cubic yards of base material.

Cubic yards of base material × 1.25(compaction factor) = cu. yards of base material needed

Cu. yards of material needed × 1.25 ton/cu. Yard = Tons of material needed

Example problem:
A 4’ tall wall that is 20’ long with concrete blocks that are 6” wide is to be built on the job site.

6” wide block + 12”=18” = 1.5’

20’(length) × 1.5’ (Width) × 4” ÷12”= 10 cu ft. base needed before compaction

10 cu. ft. × 1.25 (compaction factor for base material) = 12.5 Cu ft. base needed

12.5 cu ft. ÷ 27 cu ft. = 0.46 cu yards base or ≈.5 cu yards

Complete the following 5 problems, using the sample problems as reference and to guide you through the calculation steps if needed. Make sure you write down your calculations work and include the proper units on your answers. Turn in your problems to the instructor for grading. Upon satisfactory completion the instructor will provide part 2 of the lab.

Calculations:

Problem 1:

A jobsite it to have a walkway that is 50’ x 4’ installed.

How much base material is needed for the walkway? Calculate in both cubic yards and tons.

How much sand is needed for the 1” setting bed? Calculate in both cubic yards and tons.

Problem 2:

You have been given a design that includes a 15’x25’ patio. The client expects there will be heavily traffic and it is going to be on sandy soil.

What depth of base would you use and why?

How much base material is needed for the patio? Calculate in both cubic yards and tons.

How much sand is needed for the 1” setting bed? Calculate in both cubic yards and tons.

Problem 3:

The landscape design contains a large circular patio. The patio has a radius of 15'.

Area of a circle= π(or 3.14) x R^2

How much base material is needed for the patio? Calculate in both cubic yards and tons.

How much sand is needed for the 1" setting bed? Calculate both cubic yards and tons.

Problem 4:

The design shows a block retaining wall that is 6' high and 35' in length. The block to be used is 12" in width.

How much base material is needed for the wall? Calculate in both cubic yards and tons.

How much sand is needed for the setting bed?

Problem 5:

You are going to install a 6"x6" timber retaining wall that is 3' high and 25' in length.

How much base material is needed for the wall? Calculate both cubic yards and tons.

Hardscape Installation LAB

Part 2- Unit Paver and Stone Coverage and Edging Calculations

When building hardscape features such as patios, walkways, and driveways, it is important to be able to calculate the materials required for the surface of the hardscape feature. You will complete this portion of the lab by yourself. You will be provided a calculator.

Unit Paver coverage:

When calculating the number of pavers needed for an area, first calculate the area to be paved. However, it is also important to know the coverage of the pavers being used. Pavers can range from .25 to 5.0 units per square foot. Some pavers may be as large as 24" x 24", some as small as 2.5" x 2.5". Standard 4"x8" pavers require 4.5 pavers/sq. ft.. Manufacturers may only sell pavers by the pallet or sell a minimum number of sq. ft.. This way they don't have to worry about partial pallets. This has become more common as many pavers are meant to be laid with different sizes of block mixed into one patio. Some designs even mix different colors within the same patio.

When calculating the number of pavers, it is important to order extra pavers to cover broken pavers from transport and the possibility of cuts. The General rule is a minimum 5% should be added to accommodate. In many situations, the design of the patio may have curves or unusual patterns that involve cutting the pavers to fit in the area; therefore, the surplus percentage should be increased to 10-15%.

Sample Paver Coverages:

When paver coverage is unknown, you can calculate coverage per square foot using this equation:

1 sq. ft. = 12" x 12" = 144 sq. in. in one sq. ft.

Paver size =L" x W" = sq. in. paver covers

144 sq. in. ÷ sq. in. paver covers = pavers per square ft.

4"x8" paver	4"x8"=32 sq. in	144sq. in. ÷32 sq. in. = 4.5 pavers per sq. ft.	
10"x10" paver	10"x10"=100sq. in	144 sq. in.÷100 sq. in. = 1.44 pavers per sq. ft.	

Formula for pavers:

Patio area (L x W) x units per square foot = number of pavers need

Number of pavers needed x **1.05(5% extra) up to 1.15(15% extra)** = Total number of pavers needed.

Example Calculation: How many pavers are needed for a patio that is 40'x20' in the following paver sizes?

Pavers: 4"x8" = 4.5 per sq. ft. 8" x 8" = 2.25 per sq. ft. 8" x 12" = 1.50 per sq. ft.

(4"x8") 40'x20'= 800 sq. ft. x 4.5 units per sq. ft. = 3600 pavers needed x 1.10 (surplus factor) =3960 pavers

(8"x8") 40'x20'= 800 sq. ft. x 2.25 units per sq. ft. = 1800 pavers needed x 1.10 (surplus factor) =1980 pavers

(8"x12") 40'x20'= 800 sq. ft. x 1.5 units per sq. ft. = 1200 pavers needed x 1.10 (surplus factor) = 1320 pavers

A typical Pallet or pavers has approx. 96 sq. ft. of coverage:
(4"x8" pavers) – 96 sq. ft.*4.5= =432 pavers/pallet (8"x8" pavers) - 96sq.ft.*2.25= 216 pavers/pallet
(8"x12" pavers) – 96sq. ft.*1.5 =144 pavers/pallet

Flagstone and Natural stone coverage:

Natural stone has become more popular for use in patios. Stone may range between 40 to 80 sq. ft. of coverage per ton. The reason for the range is because of the variance in thickness of the stone and the fact that stone pieces are not as uniform as unit pavers. There is no extra or surplus factor for stone, as this is figured into the range of coverage.

Formula for stone:

square feet of patio area ÷ square feet coverage per ton= tons of stone needed

Example:

A 40’ x 20’patio with Blue stone is to be installed. Blue stone coverage is 60 sq. ft. per ton.

Area of patio ÷ sq. ft. of coverage = tons of materials

40’ × 20’= 800 sq. ft.

800 sq. ft. ÷ 60 sq. ft. /ton =13.333 tons or ~ 13.5 tons Blue stone

Patio Edging:

Edging is placed around the outside of patios to help hold the paving material in place. Extending the base material beyond the patio by at least 6” helps hold the edging by giving it a firm base. (see Figure 1 below) Also reference Figure 22-13 on page 288 of the Landscape Construction textbook.

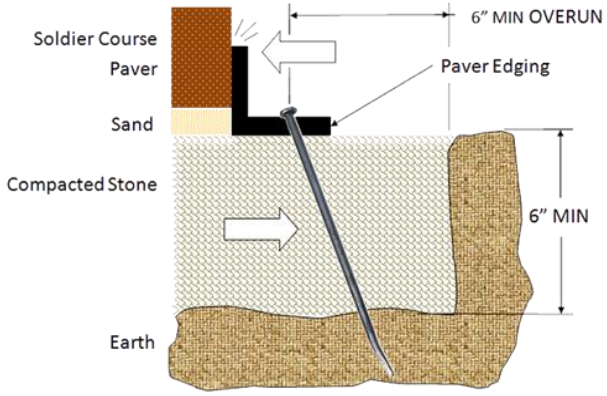

Figure 1 From-http://www.mcpsupply.com/this-old-house-paver-edging-spike/

Edging is purchased in linear feet, some come in 8’, 10’, or even 12’ sections. In order to calculate the amount needed, calculate the perimeter of the paved area. Formulas:

Perimeter of square or rectangle=(2L) +(2W) Circle perimeter = π(3.14) × Diameter

Example:

In a 40’ x 20’ patio, 40’+40’+20’+20’=120’ perimeter

120’ of edging would be needed. 8’ sticks are to be used

120’/8’=15 sticks of edging needed for patio.

Calculations:

Complete the following 2 problems, using the sample problems as reference and to guide you through the calculation steps if needed. Making sure to write down your calculations work and include the proper units on your answers. Turn in your problems to the instructor for grading. Upon satisfactory completion the instructor will provide part 3 of the lab.

Problem 1:

The design calls for a 15'x20' patio. Calculate the number of pavers needed for the patio in each size given.

4"x8" pavers

8"x8" pavers

12"x12"pavers

How many pallets of each paver are needed for the patio?

4"x8" pavers @350 per pallet

8"x8" pavers @ 200 per pallet

12"x12"pavers @ 75 per pallet

How much sandstone is needed to do the same patio? The coverage for sandstone is 70 sq.ft./ton.

How much paver edging is needed for the patio? How many 8' sticks would you need to buy?

Problem 2:

You are installing a large circular patio with a walkway to the patio. The patio has a diameter of 25'. The walkway is 3'x15'. Area of a circle= $\pi(3.14) \times R^2$

How many pavers are needed for the main patio? The pavers are 6"x6" pavers

How many pavers are needed for the walkway? The pavers are 10"x10"

How much formal bluestone flagging is needed to do the same patio and walkway? The coverage is 40 sq.ft./ton.

How much paver edging is needed for this patio and walkway? How many 10' sticks of edging are needed?

Hardscape Installation Lab

Part 3-Patio Installation Lab

You will be applying the procedural knowledge you have learned of installing a patio into practice. Prior to beginning this portion of the lab, you will need to get with the instructor to get the equipment and materials required to complete the lab. You may be required to gather them at the site of the installation. Use the materials and equipment as a checklist to make sure you have everything you may need. You will work alone on this project, unless the instructor tells you to work in teams.

Materials and Equipment:

- Patio paving materials-different unit pavers and flagstone
- Deadblow hammer/Rubber mallet
- 21AA or crushed concrete for base material
- Clean sand
- Landscape fabric (For this lab you will be placing landscape fabric between the layers of base material and sand, this will allow for easier clean up and reuse of the materials.)
- Patio edging
- Broom
- Tamper/Compactor
- 1” Screed rails
- 2”x4” Screed board
- Hand Trowel
- Small hand level
- Garden Rake
- Contractors Level
- Personal Protective Equipment-Gloves, safety glasses, ear plugs/muffs (if using power equipment)

Safety:

You will need to check all equipment prior to use, making sure they are in good working condition prior to use. You have been made aware of the hazards of powered machinery (if using powered compactor) and hand tools used in this program. Equipment and tools should be used properly and in a safe manner. Proper personal proactive equipment should be used when necessary.

Initial Preparation Procedure:

1. Excavate the designated area to the proper width and depth and tamp with tamper/compactor. Depth is calculated based on paver thickness and use.
2. Place landscape fabric down to keep subgrade and base material separate.
3. Shovel in approximately 2" of base materials on the landscape fabric then tamp base material with tamper/compactor.
4. Continue adding base material and tamping in 2" lifts, until base material is 4" in depth.
5. Place another piece of landscape fabric to separate base layer and sand layer.
6. Lay 2, 1" screed poles about 8' apart parallel to each other.
7. Begin tossing bedding sand in between screed poles.
8. Using a straight 2"x4" board, screed the bedding sand between the screed poles flat. This is achieved by pulling the board perpendicular to the screed poles. Continue adding and screeding sand until entire area has screeded sand.
9. Removed screed poles, filling the area vacated with sand.

Paver Installation Procedure:

1. Begin laying patio pavers or paving material. You may lay them in any pattern you choose. Typically beginning in a corner or on and edge and working outward. Common example patterns are on pg. 87 of the Landscape Contractor manual.

2. Complete laying the rest of the patio, ensuring pavers are tightly aligned.

3. Install patio edging along one edge of patio.

   STOP: Ask your instructor to check your work.
   The instructor may give feedback and may ask you to repeat aspects of the lab for practice. Fix any of the issues discussed with instructor and have the instructor check your work again. Once instructor approves, continue to next step.

Natural stone Installation Procedure:

1. Remove the Pavers and edging to prepare for laying natural stone.

2. Using a garden rake, rake any of the disturbed areas of sand.

3. Using natural stone pieces, lay out an area that is ≈5'x5', leveling each stone after placement with dead blow hammer/rubber mallet. Keeping in mind the gapping between pieces should be uniform.

   STOP: Ask your instructor to check your work.
   The instructor may give feedback and may ask you to repeat aspects of the lab for practice. Fix any of the issues discussed with instructor and have the instructor check your work again. Once instructor approves, continue to next step.

Clean Up Procedure:

1. Clean up natural stone pieces and place back in designated area. Rake and clean up sand and base materials to be reused, placing all materials and equipment back in their respective places.

Hardscape Installation Lab

Part 4-Retaining wall Installation Lab (TBD and written later)

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2019

STATE OF MICHIGAN
DEPARTMENT OF CORRECTIONS
LANSING

LESSON PLAN

Module or Course Title: Landscape Design

Unit: Landscape Design

Lesson: Flower Garden Design
This unit would be used in the Michigan Department of Corrections (MDOC) horticulture programs in the Tier 2 Landscape curriculum. Each student that continues into the Tier 2 Landscape tract, would complete this lab. The Flower Garden Design Lab would give the student application of the process one would go through when designing a flower garden or bed. Because of the way the MDOC horticulture programs are structured, the student is responsible for learning the content. The instructor is the facilitator and provides the student with the resources and materials once the student has reached the section in the course.

Educational Goal:

To apply the principles and practices of landscape design in the creation of a flower garden design.

Objectives: Student will:

Be able to describe the elements and principles of landscape design
Better understand the plant selection process involved in landscape design
Be able to apply the elements and principles of landscape design
Be able to select plants to be used in a landscape
Be able to create a small landscape design

Resources and References:

Michigan Nursery & Landscape Association. (2010). Michigan Certified CORE Reference Manual. Okemos, Michigan: Michigan Nursery & Landscape Association.
Sauter, D. (2011). Landscape Construction (3rd ed.). Clifton Park, New York: Delmar, Cengage Learning.
Ingels, J.E. (2009). Landscaping: Principles and Practices (7th ed.). Clifton Park, New York: Delmar, Cengage Learning.
Shry Jr.,C.L. & Reiley, H.E. (2017). Introductory Horticulture (9th Ed.). Stamford, Connecticut: Cengage Learning.
Industry Videos selected by instructor

Supplies and Equipment:

For Students:

Pencil/pen
Drawing scales
Ruler/straight edge
Drafting triangles
Circle templates
Drafting Compass
Colored pencils
Calculator

Tape Measure
Clipboard
Scrap paper
Graph paper
Plant list

For instructor:

Seed catalogs/Nursery catalogs
PowerPoint Slide Handout on Landscape Design
Plant list of plants being grown
Sample landscape designs
Pen/Pencil
Clipboard
Grading Rubric
Reference Books-See above List
Computer and projector/TV-for playing videos
Headphones

Estimated Time: Estimated 8 hours (2 hours classroom time, 6 hours lab time)

Safety: Student has completed an entire unit of safety in the Tier 1 curriculum of the horticulture program. Student would have watched videos pertaining to proper hand tool use and powered equipment operation and use prior to completing this lab. Tool use in the lab is minimal.

Teaching Procedures

Interest Approach:

The lab is designed so that students learn and complete the process in designing areas within the landscape. Most of this lab is lab time. This allows students to research and select plants to be put in their design. Showing students multiple landscape designs, of varying size and scope, then having a discussion with the student about how the elements and principles area applied, will help the student better understand how to apply the elements and principles within their own design. Instructor can use the PowerPoint slides as a presentation and discussion, along with using it as a handout. Additional videos may also be of aid to the students. In the MDOC, the horticulture program grows all the plants for the flower beds and areas inside the facility. Students can't just pick any plants they want for the design. It is important to make sure you, the instructor, give the student an updated plant list of what is to be growing for that season.
Variation can be added to this lab by using the tactics below to enhance the learning experience.

Site Control: Have the students design flower beds that are around the facility. It is important for the students to see past designs, make sure to keep the created designs in a folder.

Competition: Have the students in this portion of the curriculum all design a flower garden for the same area. After completion have the other students in the program vote on which design they like the best.

Implementation: After completion of the design lab, have the student plant and maintain the bed they designed throughout the growing season. This would be a great addition to continue the process, as it would be in the industry.

Additional Lab Possibilities: If timing allows, having the student begin this lab in March or April. This way students could complete the design before planting season and continue the design to end product process. Have the student calculate the estimated cost of the materials needed for the lab. The instructor would have a bit of leg work to prepare for this addition and it may require some additional resources, but it could be a great learning opportunity for the student. Adding the creation of a fertilizer/maintenance plan for their designed bed would further the depth of learning as well.

Student Learning Objectives & Strategies:

Using Bloom's Taxonomy of Educational Objective, the goal of the lab is to aid in moving the student from the basic levels, to higher level thinking. For each objective listed below, it shows the level for the corresponding objective according to Bloom's Taxonomy.

Summary of Content	Blooms taxonomic level	Suggested instruction strategies
Describe the elements and principles in landscape design	Remembering, Understanding, Analysis	**Summarize, Clarify, Differentiate**: From reading text and through watching the videos
Better understand the plant selection process involved in landscape design	Remembering, Understanding, Analysis, Creating	**Differentiate, Identify, Interpret, Infer, Select:** From reading text, through watching the videos, and researching plant information
Apply the elements and principles of landscape design	Application, Analysis	**Perform, Differentiate, Identify, Interpret, Select:** Using proper tools and techniques to manipulate materials
Select plants to be used in a landscape	Remembering, Understanding, Analysis, Creating	**Differentiate, Identify, Interpret, Infer, Select:** From reading text and researching plant information
Create a small landscape design	Remembering, Understanding, Application, Analysis, Evaluation, & Creating	**Summarize, Clarify, Differentiate, Identify, Interpret, Infer, Create, Select, Design, Perform:** Reading text and through watching the videos, researching plant information, and producing a final product

Delivery Process:

1. READ: Student will first read CGIP CORE Reference Manual Ch. 8-Landscape Design.
2. READ: Student will read and take notes on PowerPoint Slide Handout titled Designing the Landscape.
3. WATCH: Student will watch videos on Landscape Design on a large screen or other device in the classroom.
4. DISTIBUTE LAB SHEET & MATERIALS: Instructor will give the student the lab sheet.
5. GATHER: Student will gather the materials and equipment needed to complete the lab.
6. COMPLETE: Following the instructions, student will complete the lab.
7. COMPLETE: Student will complete questions at the end of the lab.
8. FINAL GRADE & PROVIDE FEEDBACK: Student will turn in completed design and questions for grading. Instructor will provide feedback over the whole lab and give the final grade based on the grading rubric.

Summary and Review:

Many students in the program have little to no experience with landscape design. This lab gives them their first experience of design on a basic level. This lab can be carried through the installation and maintenance process give the student deeper knowledge on the overall design process from the start of the design to a finished installed product. Having two students work together may be a good option as they can learn to work together making decisions, but also help each other understand the overall process and application of plant selection and design.

Based on the structure and format of the MDOC horticulture program, students may need to work with a tutor to further the students understanding of the design process.

Evaluation:

Use the grading rubrics below the instructor will watch student to verify process is being followed correctly. Student will receive points for the items completed correctly. Student must get 80% to pass the lab. Student will need to work with a tutor prior to trying the lab again.

Grading Rubric:

Description	High Performing	Medium Performing	Low Performing	Total Points
Design: Plants	Design includes proper number of plants 5 points	Design included some of required plants but not all 3 points	Doesn't include proper number of plants 1 point	**___/5**
Plant List	Design includes plant list with required details 10 points	Design includes plant list, missing some of the details required 5 points	Plant list not existing on Design, or has very minimal details included 1 point	**___/10**
Key/Legend	Properly indicated on design 5 points	Parts included but not complete 2.5 points	Not included on design 0 points	**___/5**
Overall Presentation	Overall design is clean and organized, easy to read 5 points	Design is complete but not well organized and may be hard to read 3 points	Design is disorganized and hard to read 1 point	**___/10**
Safety	Student uses tools properly and wears PPE when necessary 5 points	Student may use tools properly and does use PPE when necessary 3 points	Student does not use tools properly and does not wear PPE 1 point	**___/5**
Questions	All work is written out neat and organized and easy to follow with correct answers 10 points	Work is semi organized but may be difficult to follow with some correct answers 6 points	Work is written out poorly, not in complete sentences with incorrect answers 2 points	**___/10**
TOTAL:				**____/40**

Flower Garden Design Lab

This Lab is designed to help you learn and understand the process of basic landscape design. You will be working on this lab alone unless the instructor tells you to work in pairs or teams.

Resources:

Seed catalogs/Nursery catalogs
Plant Books in reference cabinets
CGIP CORE Manual
PowerPoint Slide Handout on Landscape Design
Scrap paper
Graph paper
Plant list of plants being grown

Equipment:

Pencil/pen
Drawing scales
Ruler/straight edge
Drafting triangles
Circle templates
Drafting Compass
Colored pencils
Calculator
Tape Measure
Clipboard

Procedure:

1. The instructor will assign a garden bed. You will be provided plant list, scrap paper, and graph paper.
2. Look at sample designs provided by the instructor and in the reference books. Think about how you want the garden to look. Questions to think about before design are: What you are trying to express in your design? What colors would pair with the existing plants in your bed? What's the best view of the garden?
3. Complete a site analysis of your garden bed. Take measurements of the length and width, writing them down on scrap paper.
4. Determine what plants are currently in your assigned bed. Refer to the book and PowerPoint slides for assistance.
5. On scrap paper, sketch the garden bed and the existing plants. Ask a tutor, worker, or the instructor for assistance identifying the plants.
6. Lay out the bed on graph paper, starting with the boundary lines. The drawing should be to scale and show the actual length and width. The existing plants should be on the drawing in their proper locations.

7. You may design the flower bed in any way you choose but your design must include:
   - At least 3 different perennials (no more than 5 of any one type)
   - At least 5 different annual plants
8. Using the provided list of the annual and perennial plants, find information on plants from the list that you find interesting or match a color you would like to use in the reference books, seed and nursery catalogs. Information such as size (height and spread), flower color, light conditions, form, will help you as you create your flower bed design.
9. Create your flower bed design by drawing the placement of the plants you choose.
10. Create and include a plant list with the name, quantity, color, spacing and height of each plant.
11. Create and draw a key/legend that gives reference to where your bed is located.
12. Finalize and complete your design drawing.
13. Complete the questions at the end of this lab.
14. Turn in your design, along with the completed questions to the instructor. The instructor may give feedback and may ask you to repeat aspects of the lab for practice.

Questions:

Complete the following questions in your own words.

1. What part of designing your garden did you find most difficult? What was the hardest part of the design process? Explain your answer.

2. What was the longest part of the design process for you? Which step took you the longest? Explain your answer.

Continued on next page….

3. How would you describe your design to someone else? If you were talking to someone over the phone, how would you describe the look of your flower garden to them?

4. You may look back at your notes to review the design elements. What are design the four design elements? Explain how you used one of the elements in your design.

5. You may look back at your notes to review the design principles. What are the six design principles? Explain how you used one of the principles in your design.

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