Beyond the Book Learning, LLC
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September 13, 2017

Dr. Brandon Schweitzer
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Dr. Schweitzer,

Please find the final report with your edits completed of the Construction Academy Programming. This is the first deliverable for the project.
The recommended enhancements will be submitted for your review on Friday, September 15th through an electronic dropbox as the files are too large to transmit via email. . Please let me know if you have any questions.

Enjoy your day,

Christine M. Fiori

Christine Fiori, PhD, PE
Project Lead

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Overview

Beyond the Book Learning, LLC was contracted to evaluate various components of the Construction Academy programming. The Construction Academy is a program within the UDC-CC Workforce Development and Lifelong Learning Division whose mission is to reduce unemployment and underemployment in the District of Columbia by enhancing the skills of its residents. Over the past month, a review of the program was conducted and included an on-site visit, discussion with staff and review of course materials both onsite and electronically. The course specific materials reviewed included course syllabi, presentations, quizzes and tests, as well textbooks and other online resources that are used in the programming.

The review revealed that the courses provided under the Construction Academy programming were relevant, provided a sufficient depth of knowledge and deliver a high quality education to the students. The curriculum is based upon highly regarding industry based standards from reputable education providers and is appropriate for students desiring to enter the construction industry and related fields. The only shortfall within the programming was lack of appropriate space for conducting some laboratory exercises and classroom set ups. Of utmost concern is the lack of appropriate ventilation in the laboratory spaces where soldering is taught to the students. This is a health and safety concern and should be addressed immediately.

While the academic curriculum is the focus of this review, it should be noted that the program does provide other services to the students that compliment the material learned in the classrooms and laboratories. The career services and the development of industry relationships is a key strength of the program and should be expanded. Helping the residents of the District with job placement is an extension of the education provided and a valuable service.

The detailed results and recommendations of this review are presented within this report and are organized based upon the key outcomes desired by UDC in the request for proposal.

Relevancy of the courses provided under the Construction Academy programming

The Construction Academy offers a wide range of courses to prepare students to enter various careers in the construction industry. The foundational curriculum is built upon the NCCER Core Curriculum: Introductory Craft Skills which is enhanced by a core math supplement, a First Aid/CPR course, an OSHA 10 construction certification as well as workplace readiness and soft skills. These courses form the foundation of many of the traditional construction Pathways offered. The courses in the Apartment Maintenance, HVAC and BIM Pathways add great depth to the offerings provided within the Construction Academy programming. Overall, the courses provided under the Construction Academy programming are highly relevant to students seeking positions in construction related fields. The relevancy of each of these courses is assessed below.

Construction Math Curriculum

Module 2 of the NCCER Construction Core Curriculum covers the concept of construction related mathematics. The Construction Academy found that many of their students were struggling with the material in this module and therefore created a new math curriculum, specifically designed for their students. This course provides students a solid foundation in mathematical concepts and enables them to more successfully progress through the more advance construction math course. Math skills are necessary for all apprenticeship placements and many union and trade organizations require prospective hires to pass a math assessment prior to placement. The course is critical to students entering the construction related disciplines.

Bring Your A Game To Work

This program, Bring Your "A" Game to Work, was created and managed by the Center for Work Ethic, based in Denver, Colorado and was introduced in the construction introductory course, NCCER Construction Core Curriculum. Students receive this course during the first couple of weeks, prior to starting the NCCER component.

Bring Your 'A' Game to Work focuses on building seven foundational work ethic behaviors:

- Attendance,
- Appearance,
- Attitude,
- Ambition,
- Acceptance,
- Accountability and
- Appreciation.

Following completion of the training, participants are eligible to earn the Certificate of Work Ethic Proficiency through an online assessment if students receive a score of 90% or higher.

The course focuses on developing work ethic and soft skills – skills that are portable from one job to another. Employers are looking for workers who already possess these skills. Soft skills like professionalism, relational skills, conflict resolution and a willingness to take direction are generally more desired by employers than the specific skills a particular job requires. This course is highly relevant to students entering the construction related disciplines.

NCCER – Core Curriculum: Introductory Craft Skills

The NCCER Core Curriculum is delivered to students through a series of modules. Each module covers fundamental construction knowledge and skill sets required to enter the

construction related fields. The Construction Academy uses 8 of the 9 modules contained in the NCCER Curriculum. These modules include:

- Module One – Basic Safety (Construction Site Safety Orientation)
- Module Two – Introduction to Construction Math
- Module Three – Introduction to Hand Tools
- Module Four – Introduction to Power Tools
- Module Five – Introduction to Construction Drawings
- Module Six – Introduction to Basic Rigging (optional module, not covered
- Module Seven – Basic Communication Skills
- Module Eight – Basic Employability Skills
- Module Nine – Introduction to Material Handling

Completing this curriculum gives the trainee the basic skills needed to continue education in any craft area they choose. The course also serves as a prerequisite for all of the construction trades such as carpentry, electrical, plumbing, HVAC and BIM.

The learning objectives for each of the modules, the course syllabi and other references used by the instructors all highly relevant to students entering construction related fields. In reviewing the PowerPoint slides for each segment of the modules, the material was presented clearly and each module built upon the knowledge achieved in the previous modules. This scaffolding is helpful to students as they learn the fundamentals of the construction trades. Additionally, quizzes, assignments and tests were all geared to assess student attainment of the module learning objectives. Students receive the NCCER Core certification if they have successfully completed all modules and score a 70% or higher on each of the modules as well as successfully completing all the Performance Profiles. Utilizing this Core Curriculum is an excellent choice.

Heating Ventilation and Air Conditioning Courses

The HVAC Theory and Installation courses prepare students to take the ESCO Heating, Electrical, Air Conditioning, Technology (H.E.A.T.) exams. Students must receive a score of 70% or higher on the H.E.A.T. exam to be eligible for the HVAC Installation Class. Upon

successful completion of the HVAC Installation course, students are eligible to take the ESCO H.E.A.T. Plus Performance and H.E.A.T. Core certificate exams. The order of the courses and the certifications that are available to the students provide a structured approach to HVAC training that results in highly qualified technicians. Each course is reviewed below.

HVAC Theory

This course presents the concepts of Heating and Air Condition including air and refrigerant distribution systems. The course reviews the formulas and concepts necessary for HVAC calculations and explores the natural sciences behind the manipulation of HVAC systems to restore proper and balanced temperatures. Students learn the operation of a basic air conditioning circuit as well as electrical circuits and troubleshooting, the operation of gas furnaces, and their troubleshooting, repair, and replacement. The materials in the course prepare the students to take the HEAT exam, a nationally recognized certification in basic Heating, Electrical, and Air Conditioning Technology. The course contains excellent content and the hands on components increase the learning for the students.

HVAC Installation

This course is designed to equip the student technician with skills necessary to design and install human comfort air conditioning systems in residential and light commercial applications. Students learn to review the needs of the prospective air-conditioned space and design a system to meet heating and cooling needs. Upon completion of the design students then perform all the processes involved in installation, start-up, and routine maintenance. The approach of the course enables students to learn the theory, the design and then the installation, providing a holistic approach to HVAC systems. This learning approach engages students and provides relevant, hands-on training that goes behind the theory.

CFC 608 Certificate Course

The CFC 608 course is a two day course that students can complete any time after they have finished the HVAC Theory course. A certification exam is given upon successful competition of the two day course. The proper handling of refrigerants is critical knowledge for students who will be working within the HVAC profession. Having this certification improves the employability of the students, making them more attractive to potential employers.

Certificate for Apartment Maintenance Technician (CAMT)

The CAMT Training includes seven courses, six technical courses consisting of hands-on classroom training plus online modules and a 10-module online non-technical course, which teaches a number of essential soft skills through demonstration and interactive scenarios. These courses are designed to build upon each other and prepare the student to enter the apartment maintenance field.

The following are the courses contained in the CAMT training and a review of their relevancy to students who desire employment in the apartment maintenance field:

Interior / Exterior Maintenance & Repair

The Interior and Exterior Maintenance & Repair course covers how to keep the interior and exterior of the buildings on a property in excellent shape, both through repair and preventive maintenance. This course also teaches students how to perform "make-ready" activities, and gives them helpful checklists to use on the job. This course is key to helping students understand the importance of interior/exterior maintenance for apartments. Employees who comprehend the importance of timely repairs and preventive maintenance are sought by industry. This course provides this necessary training and is relevant to student success.

Electrical Maintenance & Repair

The Electrical Maintenance and Repair course provides the solid foundation in electrical work that students must have to be successful on the job, especially when working with appliances and HVAC. The content covers key topics related to electrical repair and maintenance to include: understanding systems and circuits; switches, receptacles, and fixtures; using meters; making diagnoses and repairs; following regulations; and safety issues. These skills sets are critical and relevant to students desiring to work in the apartment maintenance industry.

Plumbing Maintenance & Repair

The Plumbing Maintenance and Repair course teaches students how to maintain and repair plumbing systems and fixtures. The material in the course covers key elements related to plumbing systems to include: an overview of the systems; key materials and equipment; pipes, fittings, and valves; and fixtures and appliances. Plumbing maintenance and repair are skills that are required of any student entering the apartment maintenance field and very relevant to the future success of the students.

Heating Maintenance & Repair

The Heating Maintenance and Repair course teaches students how to maintain and repair heating systems. The content includes troubleshooting systems and teaches the latest industry standards. This skill set is one that all apartment maintenance workers are required to possess. The course is highly relevant to students who desire to enter this job market.

Air Conditioning Maintenance & Repair

The Air Conditioning Maintenance and Repair course teaches students how to maintain and repair air conditioning systems. The content includes troubleshooting systems and teaches the latest industry standards. This skill set is one that all apartment maintenance

workers are required to possess. The course is highly relevant to students who desire to enter this job market.

Appliance Maintenance & Repair

The Air Conditioning Maintenance and Repair course teaches students how to maintain and repair appliances. This hands-on approach to repair common appliances found in most apartment facilities provides students with a skill set that is in demand by the apartment maintenance industry.

Online CAMT Soft Skills Training Outline

The Soft Skills Training is comprised of 10 online modules designed to improve soft skills through the use of interactive scenarios in which the students evaluate the effectiveness of the individual depicted in each scenario. These modules include:

- Welcome to the Industry
- Customer Service
- Teamwork
- Time & Project Management
- Money Matters
- Documentation & Paperwork
- Maintenance & Emergencies
- Safety First
- Compliance
- Wrap up

This Soft Skills module is important for the students in this Pathway to undertake, as they are not required to take the Bring Your A Game to Work training. The training approach utilizes is excellent as it requires students to evaluate the responses of an individual in specific situations that are common to apartment maintenance technicians. Soft skills are critical to a student's success in the industry and this course provides some valuable tools for them.

Professional opinion of the governing bodies and/or agencies that create, regulate and maintain the curriculum used by the Construction Academy

The curriculum materials used by the Construction Academy are primarily developed by the education arm of professional societies who specialize in producing quality curriculum that is highly relevant to the needs of the specialty trade or industry that they serve. Notable exceptions include the mathematics supplemental curriculum that was developed specifically for the students served by the Construction Academy and the Building Information Courses, which were developed by a highly-qualified faculty member who specializes in the field.

The National Center for Construction Education and Research (NCCER) is noted for their quality level of curriculum that is developed by a team of industry and craft professionals and reviewed by additional team to ensure quality, applicability and overall appropriateness of all the materials. As an Authorized Training Unit, the Construction Academy utilizes many NCCER education materials and certifications. NCCER's workforce development process of accreditation, instructor certification, standardized curriculum, registry, assessment and certification is a key component in the industry's workforce development efforts and has been for decades. Having personally worked with NCCER on two publications, I feel that their level of rigor and quality assurance in the curriculum development process is unparalleled in the industry.

The National Apartment Association's (NAA) Educational Institute is highly respected in the property and facilities management industry. It is the gold standard for educational materials that are specific to the challenges and issues that are faced within the apartment management industry. UDC-CC is considered a partner of NAA since they offer the CAMT and NALP courses at their facilities. The CAMT course is accredited by the American National Standards Institute (ANSI) which is one of the highest accreditations a program of

this nature can receive. It is my opinion that the NAA curriculum and materials are of the highest quality and excellent choices to use in the curriculum.

Evaluation of the career pathways options provided to students seeking employment in the construction related trades

The Construction Academy offers eleven different pathway options for students seeking employment in the construction related trades. Each of these Pathways has required elements that build not only technical knowledge, but personal competencies. Essential to each of these Pathways is the requirement of workforce readiness and soft skill courses. Each Pathway is evaluated for content and appropriateness to students seeking employment in the construction related trades.

Apartment Maintenance Extended Career Pathway

This Pathway allows students to move into employment opportunities in not only the apartment maintenance and construction fields, it also provides students the opportunity to learn the fundamentals associated with apartment leasing. The Pathway includes the opportunity for multiple certificates and certifications, to include:

- Certificate for Apartment Maintenance
- OSHA 10 General Industry
- First Aid CPR/AED
- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- National Apartment Leasing Professional

These certifications are indications that students have the capability, fundamental knowledge and the aptitude to succeed in the Apartment Maintenance field. The content of the Career Pathway and the types of employment for which the Pathway prepares students is appropriate for the DC market given the growth in apartment construction. It will prepare students to enter the Apartment Maintenance field.

Apartment Maintenance Career Pathway

This Pathway allows students to move into employment opportunities in the apartment maintenance industry, while providing an opportunity to learn Spanish in the workplace. This is an important skill set when working in the apartment maintenance industry, as interaction with tenants may be required. The Pathway includes the opportunity for certificates and certifications, to include:

- Certificate for Apartment Maintenance
- OSHA 10 General Industry
- First Aid CPR/AED

These certifications indicate that students possess the fundamental knowledge and the technical skills required to work in Apartment Maintenance field. The content of the Career Pathway and the types of employment for which the Pathway prepares students is appropriate for the DC market given the growth in apartment construction. However, the inclusion of some workforce readiness and soft skills courses is suggested for this Pathway, as students will be interfacing with tenants in their day-to-day operations.

Trade Apprenticeship Career Pathway

This Pathway enables students upon finishing the Core curriculum to enter a trade apprenticeship program with Industry Partners that have been developed and nurtured by the Program Leadership. These apprenticeships have the potential to lead to students entering trade unions or other trades programs to enhance their skills and improve their knowledge within specific construction related disciplines through practical experience. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED

The knowledge gained in this Pathway will enable students to enter viable apprenticeship programs with the necessary skill sets required. Of note is that due to the introduction of the new math skills curriculum more students are likely to be successful as they enter apprenticeship programs. The Pathway is appropriate for the students that attend UDC and will serve to support the growing need for construction trade personnel in the DC area.

Building Information Modeling (BIM) Career Pathway

This Pathway builds upon the knowledge received by the students in the construction core curriculum in a unique way. Building Information Modeling is a rapidly advancing area in the construction industry and there is high demand for individuals who possess the skills required to develop, interpret and update these computer-generated models. This requires highly technical and software based training and this Pathway provides that type of education. The Pathway includes the opportunity for multiple certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED
- AutoDesk Revit User

The skill sets students will gain in this Pathway will prepare them for entry level positions in construction related fields where there are many career opportunities. The nature of the construction market has changed over the past decade and many industry partners are seeking students with BIM knowledge and skills. This Pathway is unique, yet highly necessary to meet the demand of the construction industry.

Electrical Career Pathway Spanish

This Pathway requires that students complete the Construction Core curriculum prior to entering the NCCER Electrical or the Catholic Charities Spanish program for more

specialized electrical training. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED

The skill sets students will gain in this Pathway will prepare them for entry level electrical related fields where there are excellent career opportunities. There are many open electrician positions in the DC area (524 listed on Jobs.com at the time of this writing) with an average salary of $49,000. This Pathway is appropriate for the students and the market.

Electrical Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the NCCER Electrical or the United Planning Organization program for more specialized electrical training. Both training programs provide rigorous curriculum coupled with hands-on experiences to prepare students. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED

The skill sets students will gain in this Pathway will prepare them for entry level electrical related fields where there are many career opportunities. There are many open electrician positions in the DC area (524 listed on Indeed.com at the time of this writing) with an average hourly rate of $27.85. This Pathway is appropriate for the students and the market.

HVAC Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the advanced HVAC courses. The three advanced courses must be taken in sequence and include: HVAC Theory, HVAC Installation and HVAC 608. These courses provide hands-on training coupled with technical knowledge of equipment as well as proper refrigerant handling techniques.

The Pathway includes the opportunity for multiple certificates and specialty certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED
- ESCO H.E.A.T.
- ESCO H.E.A.T. Plus
- EPA 608 Certification

The skill sets students will gain in this Pathway will prepare them for job opportunities as HVAC technicians where there are available career opportunities. There are many opportunities for HVAC technicians in the DC area (369 listed on Indeed.com at the time of this writing) with an average hourly rate of $26.13. This Pathway will prepare students to enter field with high employment demand and is appropriate for the market.

Construction Field (Labor) Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the Building Futures program where they can work towards other specialty certifications.

The Pathway includes the opportunity for certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED
- Flagger Certification
- Scaffold User

The knowledge students will gain in this Pathway will prepare them for entry level job positions in the construction industry that does not require any specific trade skills. This Pathway may be a good fit for students who want to enter construction related fields rapidly, but do not desire to pursue a specialty trade. There are positions available in this field in the DC market, but not many (45 listed on Indeed.com at the time of this writing) and the hourly pay rate is much lower than skilled trades at an average of $15.22. The main strength of this Pathway is that it will provide students with a basic understanding of the construction industry as well as some workforce readiness skills.

Plumbing Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the NCCER Plumbing or the United Planning Organization program for more specialized plumbing training. Both training programs provide rigorous curriculum coupled with hands-on experiences to prepare students. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED

The skill sets students will gain in this Pathway will prepare them for entry level positions in plumbing related fields where there are opportunities for employment. Entry level plumbing positions in the DC area are available (approximately 242 listed on Indeed.com at the time of this writing) with an average hourly rate of $27.67. This Pathway is

appropriate for the students and the market, however students will need to seek additional training to ensure long term employment.

Distributor/Supplier Extended Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the Customer Service Retail program, followed by the Entrepreneur course for more specialized customer service and sales training. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED
- NRF Customer Service and Sales Certificate

The skill sets students will gain in this Pathway will prepare them for entry level positions in construction related customer service and retail industries. While not a typical career path, this Pathway may appeal to students who have an interest in construction but would rather engage with people through negotiating and selling equipment, materials or supplies. The opportunity to complete an entrepreneur course will provide students with some additional skills that individuals in the construction related trades would typically not have.

Distributor/Supplier Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the Customer Service Retail program for more specialized customer service and sales training. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED
- NRF Customer Service and Sales Certificate

The skill sets students will gain in this Pathway will prepare them for entry level positions in construction related customer service and retail industries. While not a typical career path, this Pathway may appeal to students who have an interest in construction but would rather engage with people through negotiating and selling equipment, materials or supplies.

Construction Field (Superintendent) Career Pathway

This Pathway requires that students complete the Construction Core curriculum prior to entering the Project Management program to receive additional focused management training. The Pathway includes the opportunity for certificates and certifications, to include:

- NCCER Core Certificate
- Bring Your A Game to Work
- OSHA 10 Construction
- First Aid CPR/AED
- Certified Associate in Project Management (CAPM)

The course material students will study in this Pathway will prepare them to enter the construction industry in entry level management or superintendent roles. This Pathway is heavily focused on curriculum and academic study with limited hands-on experiences. While the education the students will receive will prepare them for these positions, the addition of an internship or other field related work experience would highly strengthen the Pathway. The experience will also help students to be more competitive in the market place.

Evaluation of the Depth of Knowledge offered by the courses and information as it pertains to the construction industry

The depth of knowledge offered by the courses and information presented in the Construction Academy curriculum and supplements is outstanding for each trade area represented. A large number of courses in the curriculum prepare students to take tests leading to certifications highly regarded in the construction industry. These certificates assess the depth of knowledge that students have achieved and is an indication that the material presented in the courses sufficiently covers the requisite knowledge. Some of these certifications include the OSHA 10-hr, CPR/First Aid, the NCCER Core certificate and the Bring Your A Game to Work. These are excellent certifications for students to have when entering construction industry.

Most impressive within the curriculum are the specialized certifications that students are eligible to sit for after completing courses. The HVAC courses prepare students to take the HEAT exam, a nationally recognized certification in basic Heating, Electrical, and Air Conditioning Technology. The BIM courses lead to a REVIT certification and the CAMT program leads to an ANSI certified certification.

In addition to the knowledge that students gain in these course, the hands-on nature of the laboratory components adds a deeper dimension to the material presented and will help students transition into the construction industry successfully.

Evaluation of the relevancy of the courses and the applicability of information within the courses for students seeking employment in the construction related trades;

A detailed review of each course included viewing course lecture materials, syllabi, assignments, exercises and assessments. The content of the courses is highly appropriate for students who desire to seek employment in the construction related trades. Each course has an appropriate blend of classroom learning and hands-on activities to not only keep

students engaged, but to also prepare them for employment in the construction industry. Each Pathway in the construction related trades all build upon the foundational material in the Construction Core.

The applicability of the information presented in the courses is appropriate for students seeking employment in the construction related trades. Each course is focused on providing students with material that is relevant to the industry standards and practices. A large component of the curriculum uses materials developed by industry trade organizations, which also adds to the credibility of the program. Lastly, the instructors who teach these courses are skilled in their trades and provide the students with examples directly from their years of industry experience.

Evaluation of the design and inventory of the construction labs at our Backus and Shadd locations

A site visit to the Construction Academy locations was conducted on July 21, 2017 to view classroom and laboratory spaces at the Bertie Backus, P.R. Harris and Marion Shadd facilities. The classroom space at each of the facilities was adequate for faculty conducting lectures, however in many classrooms there were no dedicated computer or projection equipment. The addition of these assets may be helpful to faculty. These could be contained in a lockable cart system similar to the laptop computers to prevent theft.

The computers in the BIM classroom at the Backus facility were new and very appropriate for the type of instruction. The classroom was poorly arranged to ensure student engagement in lectures delivered by the instructor. Having computer stations lining the back wall of the classroom, does not allow the students who are working at those stations to both view the computer screen and watch the presentation of the instructor as their backs are to the front of the room. The other computer stations were clustered very closely around outlets. The electrical supply in this room should be updated to allow for a more

conducive classroom arrangement to ensure active engagement between the instructor and the students.

The other laboratory spaces in the Backus and Shadd facilities were simply classroom spaces with tools, equipment and supplies stored within them. The facilities were not set up to allow for either power or hand tools to be safely secured in the same classroom/laboratory space and many tools and pieces of equipment were simply left in the classroom spaces. The lack of secure storage space for equipment and material is a challenge at the facility and many of the power tools like table saws and other larger pieces of equipment are left unsecured. Additionally, the sawing and drilling that takes place in the classroom is not properly ventilated and does not have a dust collection mechanism. This is a health and safety concern.

The HVAC classroom/laboratory facilities at the facilities while spacious enough to conduct classes, were not properly ventilated to conduct laboratories that involve soldering. In both classrooms it was observed that soldering of copper piping (a skill critical in HVAC technicians) was taking place without any proper access to outside air or other ventilation. Standing fans were used to circulate the air, however, there was no other ventilation besides the standard facility HVAC system. This is unacceptable from a health and safety perspective and should be corrected if the classroom space is to be used to conduct hands-on laboratories that involve soldering. Each room was equipped with several fire extinguishers.

The CAMT course is only offered at the Shadd facility where a lab has been created for students to work on several pieces of equipment including a heat pump, several appliances, a bathtub, water closet and sink with fixtures. The laboratory space also doubles as a classroom. The equipment in the classroom is excellent for students to practice their skills, however the space was very crowded and may not be suitable for larger number of students.

Overall, the facilities visited were doing their best to serve the student population in the space available. Most of the challenges of lesser concern were associated with the cramped space or poor layout of the classroom. Of greatest concern is the lack of ventilation in the HVAC laboratory facilities.

Evaluation of the Building Information Modeling (BIM) course created for UDC-CC, WDLL and its design;

The Building Information Modeling (BIM) course consists of two parts. The first course contains 15 individual weeks of instruction and the second course contains six modules that would be completed over a 15 week semester. The module is complete with instructor notes, quizzes, lecture materials, models and exercises. Students who successfully complete the full course are eligible for the REVIT user certification.

The first course includes an overview of how BIM is used in construction and then launches into the use of the BIM software platforms of REVIT and Navisworks. The material covered in the lectures is engaging and focuses on students using the software platforms to create models. The remainder of the course focuses upon the functions of BIM that are commonly used throughout construction management, the ability to collect information, store it within a model, and then export it as needed as well as the methods for planning the construction process with the use of a Building Information Model. Unique to this course is also a focus on the need for BIM Project Execution Plans and the importance of information exchanges that promote interoperability among platforms.

The second course expands upon the knowledge students gained in the first course. It is more hands-on as students are learning the finer points of building and integrating models in both REVIT and Navisworks. The program Sketchup is also utilized in this course. The course uses various assignments to have students manipulate models using the various software platforms. The final module of the course introduces students to Cloud-Based

software platforms that are utilized in the construction industry. This includes the series of BIM 360 and its various modules such as Glue and Plan.

These two courses are designed in a manner that allows students to learn concepts, try them on their own and then build even more refined skills. The software platforms of REVIT, Navisworks and Sketchup are the most common used in the construction industry. Students who can master these programs, know how to build BIM models and then update and manipulate them are in high demand in the construction industry. The structure behind the curriculum design is excellent. Each lesson builds upon the last and students can really see the progress they are making as they build more and more complex models throughout the course. In addition to the hands-on nature of the course what makes it unique among BIM courses is the focus on the importance of information gathering and the use of BIM management models. Most courses simply cover software use, this one goes above and beyond by educating students on how important these models are for the management of construction projects. Overall the course, its structure and the materials developed are of a high quality, possess relevancy and a depth of knowledge that is beyond the scope of most courses, but highly needed in the industry. Students who take this course will be well prepared to enter the construction workforce.

Evaluation of the potential impact the courses may provide to students who may seek to enter degreed program or apprenticeship career tracks.

The courses that the students are taking within the curriculum will offer them an excellent foundation for apprenticeship career tracks almost immediately. The hands-on nature of the curriculum, coupled with the practical, straightforward manner in which the materials are written and delivered provide students with required knowledge and skills for apprenticeship programs. The structure of the curriculum will also provide them with the learning experience and approach that is utilized in many apprenticeship programs. This includes hands-on work experience supplemented with academic course work.

Additionally, the requirements to meet minimum grade standards as well as in-class performance and attendance standards will set them up for success.

Students desiring to enter a degree program will also have fundamental knowledge, but may find the level of materials presented and the pace of a degree program challenging at first. Many degree programs have hands-on learning opportunities and laboratory experiences, however, most focus on classroom learning which may not appeal to students. However, the structure of the courses in the program, the syllabi, homework assignments and quizzes will help them succeed if they decide to enter a degree granting program.

Overall, the curriculum offered in each of the Pathways will help to prepare students for greater success in either apprenticeship or degree programs. They are exposed to the structure of higher learning and the expectations that come with that higher level through the courses offered.

Conclusion

The in depth review of the course materials revealed a well-designed curriculum for each Pathway within the Construction Academy programming. The materials that students receive are clear, relevant and applicable to the construction related trades and industries. The certifications that students are eligible to test for upon completion of their courses are regarded highly in the construction industry and are sought by potential employers. Having this education and the certification improves the employability of each student, which is the mission of UDC-CC, WDLL programs.

While the core curriculum is a solid foundation and other components such as the BIM courses, OSHA 10 and Bring Your A Game To Work, one area that seemed to not be addressed well that is important in the construction industry today is sustainability. The concept is covered briefly in the NCCER Core Curriculum, but not to a large extent. NCCER has a sustainability curriculum that is written for the construction trades. The

course is entitled, "Your Role in the Green Environment." This may be another NCCER course that could be included into the curriculum, which would help students increase their employability.

Additionally, coverage of construction terms, tools, equipment and building materials would also be helpful to the students. Also, the reading drawings module in the Core curriculum is very cursory and additional knowledge may be needed if students enter the construction trades. As with the First Aid CPR/AED and OSHA 10 enhancements to the program, these additional enhancements would be excellent additions to the curriculum and help keep the students up to date with industry norms.