

Colorado Helps Advanced Manufacturing Program

Student Voices

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RUTGERS

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INTRODUCTION

Colorado Helps Advanced Manufacturing Program (CHAMP) is sponsored by the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant awarded by the U.S. Department of Labor. CHAMP involves a consortium of seven Colorado community colleges, a technical college, and a four-year university.¹ The Colorado Community College System (CCCS) provides technical assistance and management support for the consortium.

The ultimate goal of the CHAMP project is to increase the attainment of degrees and certifications in manufacturing in order to best serve employers' needs through:

- building on Colorado's existing and emerging manufacturing sector partnerships and career pathway work to develop an employer-driven curriculum;
- increased use of technology to accelerate training and reach broader audience including the redesign of existent certificate and degree programs and the establishment of new online and hybrid courses
- redesign of the current Colorado Community College System (CCCS) model for credit for prior learning to accelerate certification; and
- development of stackable and latticed certificates.
- purchase of new state of the art equipment and software

Students are the heartbeat of the above goals. CHAMP exists to facilitate their recruitment and enrollment, their development of new knowledge and skills, their earning new credentials, and ultimately, their employment in advanced manufacturing. How did students learn about CHAMP programs? What were their academic and employment goals when they enrolled? What were their experiences as they pursued their CHAMP credentials? What were the challenges and what were the successes? This brief prepared by CHAMP's third party evaluator, Rutgers Education and Employment Research Center (EERC), is based on individual and group interviews with 46 CHAMP students. As such, it only represents these specific students' experiences. Nonetheless, EERC believes that it provides a window into the experiences of students served by CHAMP over the past four years.

Part I provides a profile of the students; how they learned about their respective CHAMP program; their academic and employment goals. Part II explores students' experiences with Prior Learning Assessments (PLA); learning formats and soft skills curriculum; internships/apprenticeships; as well as their interactions with their CHAMP navigator. Part III focuses on CHAMP as a program – the challenges students said they faced, and the things they liked about their respective programs. The report concludes with some of the promising

¹ The consortium includes Front Range Community College (FRCC), Aims Community College (AIMS), the Community College of Denver (CCD), Emily Griffith Technical College (EGTC), Lamar Community College (LCC), Pikes Peak Community College (PPCC), Pueblo Community College (PCC) and Red Rocks Community College/Warren Technical College (RRCC), and MSU Denver (MSU).

practices identified by the students, and general observations. For information on who was served in the grant and their outcomes please see the brief on CHAMP Student Outcomes.

METHODOLOGY

EERC asked project leads and instructors to invite students to meet with one or more members of the EERC team during an EERC site visit. Student volunteers were scheduled for an individual or focus group session. The meetings with students lasted between 15 minutes and an hour. All were taped with the permission of the participating students. These tapes were then transcribed and analyzed to surface themes and patterns.

The invitation to students did not specify credential or program area – and thus was somewhat random in its reach. Students self-selected for the EERC interviews for any number of reasons – including schedules. The reader thus should not interpret the contents of this report as signifying more global experiences in CHAMP.

Further, to provide anonymity this brief does not identify individual students by college or program. Instead, references are made as appropriate to the students' field of study and/or credential.

PART ONE

Profile of Students Interviewed

A total of 46 CHAMP students were interviewed in the final year of the grant. Those interviews are the focus of this report. These students were enrolled at Aims, CCD, FRCC, PCC, PPCC, MSU and RRCC. Interviews were not able to be conducted with students at LCC in the final year of the grant due to time constraints on the site visit. To make sure their voices were heard, however, we did include some information from 3 LCC students that was collected in year three of the grant. Students were both traditional and non-traditional² in age; and overwhelmingly male. Only 5 of the 46 interviewed students were female students. This mirrors the relatively small number of women students in CHAMP over the life of the grant.³

One student started his CHAMP program without a GED; a few were recent high school graduates; others had graduated high school years earlier. A number of the students already had associate degrees, bachelor degrees and/or masters in a field related to technology or design. Several students had been in the military. Most of the students had been employed including holding jobs in such fields as oil and gas industry, retail sales, interior design, and solar energy (sales and installation). A few owned their own businesses, e.g. construction. Others were currently working as a bookkeeper, at a go-cart track, at Vestas, and selling tires. A handful were already working in some type of machining shop. Some students were holding

² Students 25 years and older.

³ Male 85.4% vs. 14.6% female students – See demographics section in the Final CHAMP Report

down several jobs as they pursued at their CHAMP credential. A few students were working work in their college's advanced manufacturing shop as either work study students or hourly student workers.

As a group, the students interviewed by EERC reflected the full range of possible CHAMP credentials – certificates, associate degrees and bachelors' degrees. A number of students had already earned one or more credential under the CHAMP grant, and were continuing to stack certificates and associate degrees. Several students shared their plans to continue on with their studies and to earn a bachelor's degree, or even masters. Some spoke about wanting to acquire skills for jobs they were already in or to pursue entrepreneurial activities.

The fields of study for the interviewed students included oil & gas, CAD, computer graphics, machining, welding and mechanical engineering. Oil and gas was not a CHAMP focused program but some of the classes used CHAMP purchased equipment in them.

Learning About Champ Opportunities

As discussed in other EERC reports, colleges in the CHAMP consortium utilized multiple strategies to recruit students for their respective programs including flyers and open houses. However, when EERC asked how the students had learned about the CHAMP program in which they enrolled – they most frequently stated that they found out about their programs through an online search by industry, credential or college's program offerings. A number had learned about a field of study or a specific program of study from a family member or friend. Several students learned about an advanced manufacturing program through their employer. One student shared that he learned about CHAMP when a college CHAMP faculty member visited his job site to learn more about what goes on the shop floor. A few students told the EERC team that they had already been enrolled at the college, when they heard about CHAMP through a faculty member teaching an advanced manufacturing course, or another CHAMP related course. One student had been referred to the CHAMP navigator by the admissions office with whom he explored various program options prior to enrolling in CHAMP. Another toured the newly renovated lab on a visit to the college. One student noted that they saw a flyer about the champ program and another found about CHAMP through a newspaper article. And one students heard about CHAMP by serendipity.

I heard about the field when I was visiting this drag racing motor engine guy I know. He knew about Warren Tech and the machining program here.

Academic Goals

In their interviews some students expressed crystal clear clarity about their academic and career goals, while others were still considering options as they pursued additional set of skills. A number of students said that as they were exposed to new possibilities, their goals had changed

over time – either in terms of credential or field of study. For example, one student working on an associate’s degree in CAD stated,

I initially started out studying engineering. While studying engineering, I fell in love with the software called Solidworks and decided I wanted to pursue that as closely as I could as a career choice... You can produce detailed drawings with it and hand them off to a machinist or a welder and they can use your drawings to create and assemble those parts.

Another student stated,

Originally, I came here thinking that maybe I wanted to do C&C machining and then once I took one of the software classes I realized that I liked the design work much better and so I’ve transitioned into that.

And a third student spoke of a progression of credentials as new fields and opportunities were introduced to him.

Yeah. I started in welding, technology degree. I finished that up in 2013 and decided to keep going to school because I like learning a lot and I just ended up getting introduced to the CAD and machining department through – my academic advisor and she just pretty much told me that I could keep going for my education and ended up doing my CAD associates in mechanical and my machining emphasis in advanced manufacturing as well. So I should be graduating with three associate degrees.

A few students were exploring what career path they would follow subsequent to being laid off from their jobs.

I was in oil – am in oil and gas. I was laid off for eight months, and it was looking pretty grim. So I decided to take this (mechanical engineering). And the Workforce Center gave me a grant to take it. So hopefully with my oil and gas experience, I can transition into, not architecture, but more structural, and use ...

A number of students were very specific in their interests and/or needs. One student spoke of needing a training in Revit (software program), his employer paying for his certificate.

I was working in engineering I’m the designer, so I draw in – I’ve been drawing in CAD and then giving it them. And then they convert it all. So they’re thinking they can save a step if I would draw it in Revit.

A student who had joined the military before graduating high school stated he enrolled in his current associate degree program in mechanical engineering because he could concurrently earn a GED. He then planned to “transfer when I get my associate’s or just before” so he could earn a bachelor’s degree.

Employment Goals

The CHAMP students had a diverse range of employment goals. We start with the more general goals which included a student who shared that he just wanted to job that would allow him to retire by the time he was 35; and a single dad who wanted to job that would pay between \$20 and \$30 to allow him to raise his son and get him to retirement. One welding student, a veteran, shared that since his family immigrated, “... *here a long time ago, every one of my family has served in the military and have also been blacksmiths*, he wanted to continue in the family tradition.

A few of the CAD and engineering students wanted to pursue drafting and design especially doing structural design including bridges. The student who had a degree in architecture wanted to continue her career designing interior spaces. A student who had been employed in the oil and gas field wanted to return to that field and do gas exploration. Additive manufacturing and doing composites were other job foci. A few students talked about jobs in aerospace working for NASA or for Elon Musk’s SpaceX observing that “*both have said that by 2030 they will be men in missions to Mars.*” Ball and Lockheed Martin were also identified as companies where students wanted to work.

One welding student observed “*They’re gonna need welders everywhere.*” And in fact, a number of welding students shared interest in using their skills in rather adventurous, if not dangerous jobs – underwater welding and working in the Seattle fishing industry.

The fish folk stuff do – they’ve gotta – they’re hiring the welders like crazy. You can look online right now, dude. They’ll start you off with bonuses, like up to \$10,000 and all kinds –

Others spoke about using these skills to find opportunity beyond their rural communities.

I’m considering working on the oil pipelines in North Dakota or Alaska

Regardless of their employment goal – the students were eager to use the skills they were learning and excited about the prospect of finding well-paying jobs after earning their respective credentials.

PART TWO

Prior Learning Credit (PLA)

As part of the CHAMP grant, CCCS revised some PLA policies and procedures, followed by the colleges restructuring their campus PLA procedures and staffing. While still early in the colleges’ re-configuring PLA, EERC asked the interviewed students if they had heard about PLA; and if any had applied for PLA credits. The majority of students were not familiar with

PLA, including those coming from the military. Of the students who knew about PLA, most stated that their skills did not transfer into credits.

I looked into it too but none of mine correlated either, which is weird because I was in the Army for welder/machinist so none of those carried over.

This was somewhat surprising given the system of PLA crediting skills developed within the military. It is unclear what this student had done to pursue PLA credits and at what point. Was this a timing issue in respect to the revamping of PLA on his campus or some miscommunication in the process, or some other issue?

Of note, several students did report success with PLA and were very pleased with the credits they accrued through PLA. As one student observed,

Yeah. So it saved me a year of school, 17 credits!

Learning/Format

EERC asked students to talk about their experiences with online/hybrid courses, lectures as well as hands-on labs and workshops.

Online/hybrid courses

Few interviewed students spoke about online or hybrid courses. One student noted that when he took EGT 103 and 104 (applied dimensioning and tolerancing) it was not yet online, but he believed it was now a hybrid courses. Of those who had taken an online or hybrid course, their experiences were basically positive. They liked the flexibility of asynchronous coursework, and the fact they could work at home. They found the website “*pretty easy to navigate through;*” and appreciated that instructors were available via email to answer questions.

Hands-on

Across the colleges and programs of study, students spoke positively about opportunities for hands-on learning. Many students were drawn into a CHAMP field because they liked working with their hands. For them, going to class working with their hands was very fulfilling. One student observed:

They're two different things. I mean, learning in class is looking at pictures, reading things. When you're out there in the shop, you're actually touching them, feeling them, seeing how they move and things like that. I prefer being on the shop because when I'm working I'm not gonna be in a classroom learning or writing, things like that. I'm gonna be moving machines, working on them. So I like the actual hand-on aspect of it more.

Another student stated:

I know –initially I was very kinesthetic. I learn by doing and I learn working through

A number of students recognized the need for a mix of lecture and lab, first learning concepts and then applying them, but still for these students, the emphasis was on the doing. That was truly where their learning took place.

...I wouldn't have been able to understand what we're supposed to be learning in the class if I didn't already apply it on what I'm working with.

One student quite eloquently used the metaphor of learning a language.

... I still get the most quality learning by doing. Kinda like language. You can learn it all you want, but unless you practice and speak it you'll just – you'll lose it.

Another student captured the enthusiasm for “doing” ...

it's just so satisfying watching this lifeless piece of metal become your own creation, something with youth.... kinda goofed on it, didn't get too good of a grade. But at least I learned something.

And yet another, focused on the marketability of their new skills and knowledge

I like working with my hands. This is a skill that is dying in our country. It's an industry people need in this country. You can get fantastic jobs.

Acceleration

A number of the CHAMP programs are considered Fast Track – condensing curriculum so that in a relatively short time – one or two semester certificates - students can earn a certificate in their field of study. EERC asked students how they found these time-limited programs.

In general, like Goldilocks and the three bears, most students found the pace fit their needs, “Just right. Any slower and I would be bored. Faster and I would miss things.” One student reflected that he was surprised how much he had to learn and was learning within a week. However, he felt such a pace was helpful in preparing him and his fellow students for the real world – where customers have different needs, and one needs to move quickly from one task to another.

I'm surprised how much we could learn within a whole week of just getting there, doing what we needed to do. And then the next week, we're on another weld, a different weld to do, something else. It's a lot a learning like in a week, but it helps a lot because I know some jobs, they'll put you on one spot and they'll be like, all right, you need to do this. And then after a while, they have another customer come in, and they'll just tell you, you need to quit that and do this one too. So I know what they're doing is fast, but in the field, that's how it is. Within an hour

Soft Skills

Early in the establishment of the US Department of Labor's TAACCT grants, across the nation industry partners indicated a need for better prepared workers, not only in terms of job skills but also "soft skills." Soft skills include time and attendance, team work, problem solving, leadership, and the ability to work well with supervisors, co-workers and customers. With each tier of TAACT grants, industry looked to their college partners to include more "soft skills" training in the curriculum. Under each TAACCT grant, COETC, CHEO, and now CHAMP consortium colleges have made a concerted effort to integrate soft skills into course curriculum and/or to create parallel opportunities for students to develop them. In addition to employment-based soft skills, many colleges also addressed job search skills, e.g., resume preparation, interviewing skills.

Overall the students with whom EERC spoke were positive about CHAMP's attention to soft skills. As one student commented, "helped me get into that groove of working with other people." Another student spoke of the focus on professionalism.

I think it's a fantastic addition to the program because you could just go to the program. You could be a total jerk. You could dress up in ripped or inappropriate clothing every day, and they won't care a bit because it's not in the grade. Well, they might care if it's bad enough, but the fact that there's a professionalism grade, it really gives it that workplace atmosphere, where you gotta come in. You gotta leave your bad thoughts at the door. You have to go in, gotta where this fancy program shirt. I think it's a very good addition.

Yet another student referred to the issue of respect – including towards the machines on which they were working.

Being respectful and respecting the machines, taking things in the right process. It's easy to get too excited and move too fast. ... I think it's really good that we're – we're around dangerous machines. We're gonna be in a loud kinda crazy industry. It's really good to try to hammer it into our heads that there's a certain attitude and a certain way of carrying yourself through this to keep a job.

Students also referred to building team skills; and being helped to prepare resumes and develop interview skills - "how to do a handshake, proper handshake, and you can tell by body language what that person's trying to convey."

At the same time, a number of students felt that the modules took away time from precious class time, or the format, especially the Goodwill modules initially used at PPCC were not helpful. Students who spoke about online versus face-to face soft skill training formats all preferred the face to face format.

A number of students felt that the colleges were not mindful of the students whom they were serving – many who had been in the military and/or had years of work experience. While a few felt it was helpful to “... to brush up” on their skills, some students were critical of the modules stating that they were too elementary, and therefore basically a waste of their time. In this regard, one student referred to the module on time management, and how he and his fellow students were already balancing multiple demands as they attended college.

I felt like for most students, as far as time management, they already are good at time management. A lot of us work. A lot of us go to school full-time and work full-time. So a lot of us have kids and stuff like that. So we're already – our time management skills are already up to par. So I felt like there could've been other options for us that would've been more relevant for me.

Internships/Apprenticeships

Internships are a means for students to try out and further develop their skills, as well as to explore different types of job sites. Internship programs also help colleges build and solidify relationships with industry partners, acting as a form of advertising for their advanced manufacturing programs, and having ready access to information about job openings. Only a small number of the interviewed CHAMP students had participated in an apprenticeship or internship. This reflects the pattern identified across all CHAMP students. Multiple factors affect the availability of internships: the number and size of employers in the college's service area, e.g., fewer companies in rural areas; the level of skill employers need; and concerns about liability. There is also a use factor, that is the amount of time students have available to participate in an internship.

Nevertheless, the three students who had had internships spoke positively about them. All students had earned academic credits, and one had also been paid for a “co-op internship” with Lockheed Radio Frequency.

One student shared that he now works part time at his former internship. Another student, who had interned at Ball Aerospace, told the EERC team,

They said if I came back after my associate's degree they would pay for my bachelor's degree. So yeah, probably. My employer there said I could start working now if wanted to, and he joked around about me dropping out to work now, but he said no, no, just kidding, finish your associates. Then come back!!

Work with Navigator

EERC asked students about their contact with the campus' CHAMP navigator. While most knew about the navigator, only a handful of those we interviewed had actually met with him or her. This may have been a result of the timing of these interviews in the final year of the grant.

Some of the Navigators had already left their positions and moved onto other things. For those students who met with navigator, the focus for most was academic planning – identifying courses and/or getting help with stacking certificates. A few students had found the navigator helpful with developing their resumes.” *I think I wouldn’t have the resume I have now if it wasn’t for her. I know that.*” A number of students planned to meet with the navigator as they neared the end of their program and began their job search.

Because all my jobs in the last 15 years have come from word-of-mouth, because once you’re in the industry you know everybody. Literally within days after her helping me redo my resume, I got another job, and the lady expressed that it was one of the cleanest resumes she’s had in a long time.

PART THREE

In this last section, we examine the challenges students spoke about, as well as what they found helpful about CHAMP. We end with a number of activities students identified as especially beneficial, and some general observations. As noted above, it is important that the reader keeps in mind that the students’ comments may only reflect their individual experience and/or the program in which they are enrolled. In addition, the students’ perspectives were no doubt shaped by their age, prior military and work experience as well as the field and credential on which they were working.

Challenges

Several themes emerged in students’ discussion about the challenges they experienced in their respective CHAMP programs. Some of these were personal and unique to the individual, some were specific to a campus or program of study: schedule of classes; pace and amount of work to learn; preference for hands-on work in the shop versus lecture format; and the number and status of equipment.

As noted above, a number of students were working full or part time as they pursued their CHAMP credential - balancing work and studies were a significant challenge for many. For example, at PCC, the Fast Track program met at different times of day during the course of the week. This made it difficult for employed students to establish a regular work schedule. The pace of some of the programs and the amount of content covered were also identified as challenges.

It’s so hard to get it all in. I think it’s too fast for some stuff. You have to be really dedicated. But, the teacher is really good,

One student observed that he came with some basic skills made a difference in his ability to learn course content. Without his foundational level skills, he would not have been successful in

his program. This student also echoed a few other students, stating that more hands-on opportunities were needed.

Another student spoke about the number of different programs that were being taught concurrently or sequentially.

I like learning the programs. But I wanted to just learn SolidWorks, and instead I'm learning several programs at once. Which could be good, I guess, because I'll know more than one, but it's also confusing too. I have to learn all the different commands and they're all different and we switch back and forth between the programs. I forget what is what. You learn one software for 5 weeks and then you learn another software for 5 weeks and then you learn Revit, another software, and...it's a lot.

One student observed that the math course that was required in the first term of his program felt disconnected from the remainder of the program – “I think they're a little out of touch.” However, it was not clear if this student referred to a remedial math course or a course that had been developed for his specific program.

Several students spoke about the lack of enough work stations – equipment for students to use. A few students complained about broken equipment that was not repaired on a timely basis.⁴

Students whose CHAMP classes were on a satellite campus, e.g., CCD, felt isolated, missing out on student service resources and campus events. Although this does not directly relate to CHAMP program development, it is important concern to consider moving forward. Student social integration has been found to impact rates of student retention and completion.^{5,6}

We don't get as much attention as the main campus does. The main campus always has something going on. We're kind of excluded out of it. That's one thing I wish could happen. There are things that happen on the main campus that we don't really hear about. That's one thing I wish we could change. We could be more involved with the main campus. We kind of find out things are happening after they already happened and it's too late for us.

Finally, and of note, one student suggested that the lack of available or required internships affected the extent of student skill and knowledge acquisition.

Maybe it's (internship) more of a requirement, because that hands-on actually, in that environment, that's where you're actually going to see and know, oh, this is how I apply what

⁴ See EERC's Equipment Report which explored the issue of equipment repair and the difference in follow for CHAMP purchased equipment and equipment purchased under another college line item.

⁵ Heisserer, D.L. & Parette, P. (2002, March). Advising at-risk students in college and university settings. *College student journal*, 36(1), 69-84.

⁶ Varney, J. (2007). Intrusive advising. *Academic Advising Today*, 30, 3.

I've learned. And, okay, yes, I can see myself here doing this, or – but yeah. In a classroom you get as much as you can, but it's not the same.

Positive Experiences

Overwhelmingly, the CHAMP students with whom EERC spoke were positive, if not enthusiastic, about their respective CHAMP programs.⁷ They praised the quality of the faculty, the state of the art curriculum and access to equipment, and the sense of program support and community with other students. Students also spoke of the flexibility of, and pacing of their respective programs, and CHAMP's training focus on hands-on learning.

Faculty, Curriculum and Equipment

The teachers are great. They're both passionate about transferring that knowledge to those who want it.

Across the colleges, students found faculty approachable and helpful – willing to answer students' questions. And students liked that fact that their instructors were teaching them not only the “doing,” but also “the science behind it.”

... great to really understand kind of what's involved in the science of making parts and that kind of a thing, which I never would've gotten in any other kind of a program I don't think. I mean they're great at answering questions that come up. Well, why do you do it this way and why do you do a spot drilling operation before you do regular drilling and they'll talk about the shape of the tools and what's actually happening and that sort of a thing. I think they really have done a nice job of balancing – starting out each way because it just kinda reinforces it at the next level and you have a good feel for what the level you're at is trying to do.

Another student noted the progression of skill building who said, “the projects successively bring up skills and techniques, each one builds on the one before and brings up skills that former didn't.”

Other students remarked on the pragmatics – the fact that the courses were designed to replicate real world situations and were not abstractions.

We actually get pragmatic application of the technologies. So having the facilities and the equipment on campus, and integrated into the program, really it gives you, honestly, fun experiences

My favorite part is knowing that we're actually gonna be given a blueprint of something that would be actually useful in real life. And to me that's just a bulking hammer head. But you've

⁷ It is not clear to what extent this reflects overall CHAMP student experience – or the self-selected group of students who volunteered to speak with EERC volunteered because of their positive experiences and investment in CHAMP programs.

gotta know how to make tools. And so we're actually gonna be given a blueprint for a real tool as a project and we're gonna get to make that. So that's what I'm most excited about.

The inclusion of industry standards in the curriculum⁸ was cited by one student as an important addition to his education, and an asset when he began to look for work.

During the first year you learn a lot of manual stuff on the machines, and you learn the knowledge—the background knowledge. Your second year you learn the industry standard—and it's more complicated. Most shops have people who can only do one or the other but not both. They have maybe one or two people who will know both. I will know both manual and CNC, so that will help for employment.

The diversity and the currency of the equipment available⁹ in program shops were also identified by students as important to their learning and preparation for industry jobs

"I attended school way back in the '80s here and I took some CIS programming and at the time, the school was teaching old technology and I felt like you never wanna go to school to learn something that's not relevant and so I feel like right now this program is cutting edge and is gonna be on the cusp of what is going to be with advanced manufacturing."

"So you know how to operate different types of machines, and most employers want this."

At PCC students spoke about assembling a large piece of machining equipment that had been purchased through CHAMP. This exercise gave them an opportunity not only learn to use the equipment, but to understand how it worked from the inside out, *"this whole idea of really being part of the development of equipment, not just using equipment or maintaining it, was kind of exciting."* The success of this exercise resulted the assembly and dis-assembly process becoming part of the machining course curriculum.

A student at PPCC shared that he had an immediate opportunity to utilize what he was learning, and to contribute to his own program, learning more in the process.

"I've actually built some parts for the school using some of the equipment that we got from the CHAMP grant that would normally – that would cost the school to buy a kit it was between \$1,500.00 and \$2,000.00 and it costs like \$60.00 for me to design it and make it and prototype it and then find one that actually works."

A number of students observed that their faculty seemed to focus less on grades and more on making sure that students understood what they were doing, and why. This allowed students to make their own discoveries.

⁸ Some of the machining students actually took the exam for NIMS certification as part of their program of study. As a result, they graduated with an academic credential – certificate or degree – as well as a recognized industry certification.

⁹ Much of this new equipment was purchased through the CHAMP grant. See ERRRC's brief on CHAMP equipment.

*“The instructor allows you to make mistakes. And then he will ask you ‘what did you do wrong?’
“I like learning by doing also, and the program lets you tackle projects and figure them out on your own.”*

Another student commented, (they) *“really trying to make us machinists, rather than curriculum, grade this, grade that, do this.”*

Students also appreciated faculty’s flexibility, their recognition that many students were balancing school with work and family demands. As long as students got their work done – they were open to flexible about time and attendance.

“But they’re just – they’re really understandable. I’m pretty sure that everybody is working at least some part-time job, or have a 40-hour job, and here in class for 20 hours a week. So sometimes you come in late, or you have to leave early, or – and they’re just – they’re really understanding. They’re not just, you have to be here at this time and this time. As long as you’re getting your work done, as long as you’re working on it outside of class, they really work with you. And that’s something that’s been very, very fundamentally good for me.”

Note, while this schedule elasticity may have worked well for some students – it did contrast with the soft skill training CHAMP students were also receiving – and possibly counter-acted the development of professionalism – with unknown long term consequences.

Community and Support

A sense of community and mutual support was a theme that emerged EERC’s interviews with CHAMP students. Something very positive was happening in the classrooms and shops.

“Just the atmosphere. It’s very relaxed. It’s very knowledgeable. Everybody is so knowledgeable and friendly and all they wanna do is help you and help them.”

“Pretty much everyone in the class is really cool. Everyone’s just here to kinda learn.”

Several students described the value-added of students’ sharing a sense of commitment and motivation.

I really feel like the motivated students take the time to involve themselves in other areas, besides just putting their head down and knocking out the curriculum, and really – they try and seek out other opportunities networking, as well as this program that really helps give you that competitive edge in a very competitive market

Mutual learning and collaboration, as well as inspiration were also described by the students.

“I think that’s my favorite thing in the department is just being able to see what other people are doing because it inspires me and it gives me an opportunity of going hey, well, what if you try it like this? And then they can go no or yes or whatever they do but it’s still – I still have that opportunity. You know what I mean? Which is – anyone has that opportunity. Will could come to me and be like hey, man, you should do it like that or like – culture of the program – “

“Students help out students all the time. You see student who have already done it helping out students that just came in. Little things that make it better decision wise or heat wise. Everybody gets along, everybody helps each other out. If you have a question you can go to a student and they’ll help you out. I like the help and support student and instructors have. That’s one thing you can’t find in other places.”

Promising Practices

A number of activities were identified by the CHAMP students that seemed especially important to them, enriching their experiences and/or prospects for the future.

Use of Portfolio

A number of RRCC students talked to the EERC team about the portfolios they were developing as part of their employment seeking activities. As one noted,

I think it’s good to show what you’ve done. You feel committed – if it is a resume and it’s – I don’t know. The – it seems more – a picture’s worth a thousand words kinda thing. You show them a couple quick shots of I worked in this, I worked in that.

As they were finishing up their course work these students were gathering together photos or actual samples of their work, e.g., “*floor plans and electrical plans and framing plans and stuff like that;*” with which they could showcase their work. The nature of the portfolio varied – physical objects or photos on a laptop. At the same time, students seemed mindful that they had to be selective and not include too many examples of their work.

... has three or four different projects I’ve worked on. And I’ve been told don’t bring more than that, because you either have it or you don’t. And if they see what they want, they don’t wanna see 18 different things.

It is not clear from the interview data to what extent faculty or the navigators were involved in helping students develop their respective portfolios – and what discussions surrounded them, e.g. mutual critiques and refinements. However, the development of portfolios seems to be important activity to prepare students for employment searches, and colleges should consider how they can integrate portfolios into their respective advanced manufacturing programs.

Manufacturing Meet and Greet

Over the last two years, PPCC has established an annual “meet and greet” that brings together regional manufacturers, students and faculty. The fall event brought close to a 100 people to PPCC.

PPCC faculty asked students to develop an elevator speech “*a personal sales pitch is what I call it. That impression that you can make in 30”* which they could use as they mingled with employers. The mixer also gave students a chance to learn more about the focus and operations of regional companies.

I asked every company I spoke to there. Some of them don't do any of their own CAD work so there were a couple machine shops there that don't have any CAD work. But I asked them. I was like what is it that you look for when you have drawings come in because they receive drawings from other companies and I said what do you – so even though those companies weren't necessarily catered to me when I was there, I was still able to ask the relevant questions

Company representatives also had the chance to meet students and get to know them outside of a formal job interview. Students spoke about the mutual benefits of such interactions and networking.

...just being able to go in and see these manufacturers and the people that run it and having them know your face and recognize hey, I've seen you two or three times. And I know I've seen you two or three times. That alone is – when you're in that interview for that first time, they go I've seen you like four times so.

At the fall 2016, several PPCC students displayed their work including a whimsical dinosaur. Conversations overheard by EERC included students describing how they created these objects using CNC technology and 3D printers.



Work with Industry Associations and Advisory Boards (MSU)

Students spoke enthusiastically about the experiences they had attending industry advisory boards and/or meetings of professional industry organizations, e.g., Colorado Advanced Manufacturing Alliance (CAMA). In some cases, students presented their work. As one student observed this was an opportunity for the students to show off the capacity of their college (MSU) the quality of students, and their products.

Participation in meetings with industry representatives also provided opportunities for students to hear industry's needs and training concerns. In the process they also learned how much some industries valued job applicants coming with industry recognized certificates such as NIMS certification. In addition, networking with potential employers occurred at these meetings.

... a good networking tool to talk to the industry people, and actually really cemented my relationship with ...Lockheed liaison to MSU. So that was huge for me in that respect.

Industry sponsored or affiliated student competitions were also an important experience for students. These events enabled them to showcase their work, meet students from across the nation, and gain peer and industry recognition. For example, three students from PPCC competed in Skills USA competitions¹⁰ – and won a number of awards in the technical drafting and robotics competitions. A few students also participated in the American Society of Mechanical Engineers' (ASME) human-powered vehicle competition.

General Observations

For some students, CHAMP programs provided an opportunity to enter a new field, for others it expanded their skill sets and knowledge. The comment from the student below captures this secondary group, and the dramatic impact of CHAMP on view on the field of welding.

I came into this program thinking, shit, I've been welding for seven years, man. I've been holding down the same job for 15 hours a day, sometimes four or five days out of the week, man. I got this licked. I never even knew there was more than one process of welding, man. Yeah, reality's gonna knock you right in the face.

We close this report with the observation of one student who spoke to the multiplier effect of CHAMP. He identifies the training of students, and giving them a competitive edge for finding employment; and the expanded capacity of his college. But he goes one to identify an unanticipated benefit of the program – the provision of equipment to inmates at a regional correctional facility so they could learn new skills. This, figurative and literal downstream consequence of CHAMP needs also to be recognized.

¹⁰ See <http://www.skillsusa.org>

The CHAMP grant also has given me access to so many different pieces of equipment that normally I wouldn't have. If the program didn't have the CHAMP grant, I don't think we would have the group that we do right now. And it gives me an opportunity to become competitive in the workforce. It also gives the school an opportunity to be competitive in their goals for reaching students and stuff like that to offer that education. Yeah. So three new mills, five lathes, a new mini-mil. It was pretty cool to watch that all come in, get swapped out. And those actually went down to, what, the prison down there? No, they donated them to the prison out here so the inmates can learn machining