Bay Mills Community College Pathways

A Preliminary Study:

Building

College – School – Employer Pathways

to

Promote STEM Recruitment and Retention

for

Eastern Upper Peninsula

High School Students and BMCC Students

Prepared for

Bay Mills Community College

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Perspective

A quest is underway across our nation. Spurred on by rising demand for a workforce steeped in STEM (science, technology, engineering, and mathematics), many community colleges, four-year colleges, and universities are urgently pursuing paths that will (a) deliver STEM-ready high school graduates to postsecondary doors and (b) guide college students all the way to STEM degree completion.

This paper explores the feasibility of Bay Mills Community College (BMCC) vigorously contributing to this quest on behalf of Eastern Upper Peninsula (EUP) employers, faculty, teachers, students, and parents.

Assurance for BMCC

Readers of this report should remain ever mindful that in its hunt for viable STEM pathways uniquely designed for the EUP, BMCC will not travel alone. BMCC administration and faculty need not and should not think of themselves as forging ahead alone. Instead, they can glean from countless other postsecondary institutions' experiences. In terms of quantity, the study of programs and projects noted in this paper will take readers only a short way down the many, varied STEM pathways already being developed across the country. If BMCC decides to pursue STEM leadership, much more study will be both essential and readily available.

Caution for BMCC

Even a cursory glance through this report will convince readers that secondary and postsecondary educators are employing multi-faceted methods to steer American young people toward STEM careers. BMCC will do well to carefully sort through the possibilities, select for its initial projects those deemed most viable for the EUP demographic, prioritize them, and finally sequence them. Patience among stakeholders will be sustained if everyone understands, first, how each project contributes to the pathway's end goal and, second, where each person's favored project is positioned in the sequenced plan. From the onset of this work, care should be taken to establish a transparent planning protocol that enables this understanding.

BMCC Perspective

If BMCC decides to build STEM pathways for the EUP community, all stakeholders might confidently proceed with the assurance that even one narrowly focused, short-lived project, e.g., a one-week science camp, can merge with many other projects to establish firm

ground. There will be no small ideas. Communication, collaboration, and eyes on the destination will sustain BMCC as it navigates its journey to STEM leadership.

Terminology for a Journey

A spirited conversation among secondary and postsecondary educators is traversing our nation. The topic of intense interest is – in the face of our nation's urgent need for a STEM educated and trained workforce, how shall we recruit, retain, and graduate more STEM students?

Descriptive terms employed in these conversations generally present an image of getting from here to there: bridges   transitions   pathways

This paper will demonstrate that, should Bay Mills Community College decide to progress toward EUP STEM leadership, it will have many routes from which to choose. Therefore, the term that will frame this paper is – **pathways**

Picture a single starting gate, a single end goal, and four pathways traversing from gate to goal.

STEM Connections: ……………………linking BMCC, EUP employers, and EUP students

STEM Readiness: …………remedial courses, transition courses, and dual enrollment

STEM Pedagogy: …………..professional learning for EUP teachers and BMCC faculty

STEM Communities: …………………………uniting postsecondary students and faculty

Cautionary Questions for This Journey

As BMCC embarks on this journey, fundamental questions must guide all thinking and doing.

- Are we viewing the STEM pathways we think we should design through student lenses?
- Are we relying upon our own STEM experiences or are we valuing students' narratives?
- Are we preemptively removing or, at least, ameliorating STEM barriers and pitfalls?
- Are we instinctively planning to personalize each student's STEM pathway?

Part A: Building Connections

We Need to Connect

"We need to connect." Widespread agreement already exists among Eastern Upper Peninsula employers and educators. Employers tell about frustrating searches for skilled employees eager to remain in the EUP, while administrators say they believe students do not realize how many or what kinds of jobs are available in our region.

EUP employers describe many different positions that they need to fill in order to grow their businesses, as well as the variety of skills their employees must have. They explain that they search for people who are already trained in certain skills, while expecting to do their own in-house training for skills that are highly specific to their particular enterprises.

EUP educators report that they have some personal knowledge of the employment potential for students who want to remain in the EUP, but they also recognize that their knowledge is somewhat limited. It seems that they would welcome the opportunity to learn more about this region's employment situation. They want their middle and high school students to develop first-hand knowledge about the many places of employment in the EUP and what happens at each one.

EUP students need to learn about -

- EUP companies, agencies, and institutions that hire employees
- The kinds of work that happen at those job sites

- Employee knowledge and skills needed by the EUP's many different employers

    - Technical skills for which students should pre-train
    - Soft skills that new hires should bring to any job

- Where both of the above skill sets can be learned

EUP students at both high school and college levels should be forewarned that every valuable job skill will not be conquered in campus, internship, or apprenticeship settings and that willingness to be life-long, on-the-job learners will significantly enhance their job security.

"How might we connect?"

We will begin by exploring initiatives that are underway across the nation in places where educators and employers are forging links and drawing students into interactive affiliations.

This exploration will help us consider (a) initiatives that would connect BMCC to EUP employers and students and (b) who the responsible caretakers for each initiative might be.

Linking Students to Employers

Blended Classroom Pathways
Blended STEM classrooms feature education where walls are metaphorically removed so teaching flows into classrooms from multiple sources and learners leave the confines of their classrooms electronically and/or literally to connect with outside sources of knowledge and skill building. Although blended classrooms are sometimes managed by external agencies, collaboration among EUP employers, schools, and BMCC could bring about similar results.

Consider the following example of a STEM blended classroom featuring a farm, a farmer, and a classroom. This is only one example and could easily be modified to provide students with experiences in many other STEM fields and at many other EUP work sites.

Agri-Education: Farm-to-School

- A local college provides a consultant who links a school district with an area farmer specializing in organic food production.

- This consultant oversees a contractual agreement between the farmer and the school district, introduces the farmer to one or more participating teachers, and serves as a liaison for all parties (see the college consultant's role below).

- The farmer and teacher(s) collaboratively design a nine-month blended classroom and develop a calendar of teaching and learning events, indicating when -

    - students will make field trips to the farm's learning site(s),
    - the farmer will visit the classroom in person, and
    - the farmer and students will conduct interactive video calls, during which

- the farmer will reveal (via a webcam) work that has been done at the farm's work site and changes occurring to plants and soil;
- students will show the farmer work they have accomplished and changes occurring at their classroom grow lab; and
- students and farmer will ask and answer questions, analyze data together, and determine next steps to be taken at their respective work sites.

- The teacher

  - oversees student research and assignments related to the classroom grow lab,
  - teaches students how to collect, record, and analyze data, and
  - handles logistics related to farm visits, classroom visits by the farmer, and video conferencing between students and farmer.

- The college consultant's role is multi-faceted and results in the college being viewed regionally as an influential STEM educator. Among other duties, the college consultant

  - walks the farm with the farmer and helps him/her select one or more teaching-learning sites for the upcoming school year,
  - helps the farmer select one or more topics of compelling interest to the farmer and conducive to the selected site(s),
  - instructs the farmer in matters of
    - student safety,
    - lunch and hygiene,
    - hands-on, engaged learning,
    - lesson plan design,
    - tools and materials needed for student use, and
    - facilitates planning sessions between the farmer and classroom teacher as they
      - identify segments of the year-long unit,
      - relegate each segment to an on-site farm visit, a classroom lesson, or an interactive video call exchange ,and
      - consider best teaching practices for each setting

Clearly, this blended classroom model could be applied to any STEM discipline and career field. EUP students would benefit from classrooms blended with area researchers, manufacturers, engineers, mathematicians, computer technologists, health care providers, conservationists,

and more.

This blended classroom model embodies two potential applications for BMCC.

1. Notice that the portrayed link between students, farmers, and college shares one commonality with all potential student, employer, and college collaborations. No matter which STEM discipline and career might be featured, all adults as well as students should present themselves as learners. In the blended classroom scenario described above, the farmer learns

from students as they report what is happening in their grow lab and present their data. The farmer responds with questions and processes information as learners do. Whether on the job site or in the classroom, adults should wonder, imagine, and hypothesize along with students. Thus, the blended classroom presents an ideal opportunity to model the intrigue of STEM careers. From the onset of its role as a regional STEM leader, BMCC should be careful to promote life-long learning as a characteristic intrinsic to STEM careers.

2. Notice, also, that in the blended classroom example, all teaching and learning occur in two places, the farm and the classroom. Neither one would require the use of BMCC space or equipment. Yet, by providing the STEM consultant, BMCC influences STEM education in the EUP, gains acceptable access to area high school students, and strengthens its presence as a regional educational institution.

Career Investigation Pathways
We now turn to a brief look at programs and projects underway across the nation, which share a common goal, i.e., increased STEM student recruitment, retention, and graduation.

Summer Programs
Many community colleges and universities offer summer programs that bring middle and/or high school students to campus to experience campus life and to study in a focused career field. They vary widely in focus, length, and targeted population, but most have fixed start and end dates common to many summer camps. Tulane University's Summer Enrichment Institute STEM program is unique in that it permits flexible start and end dates. Undoubtedly, Tulane is attempting to spread a wide net and draw in families with busy summer schedules.

Colorado University Boulder, in conjunction with Upward Bound, operates a summer program for Native American high school students. The following lengthy narrative is offered in its entirety as a picture of how this and similar programs can steer students toward college.

> Since 1981, students from reservations across the country have come to CU Boulder during the summer for six weeks between mid-June and late July. The 2017 cohort just wrapped up weeks of taking classes, having fun together outdoors, meeting students from different communities and tribes and generally getting an idea of what college is like. Students also take science and math classes as well as journalism, creative writing and American Sign Language.

> Richard Locklear, a high school senior from the Lumbee reservation in Pembroke, North Carolina, has participated in the program for three straight summers. He has treasured his experiences in the program, like meeting new peers from other tribes, particularly his first year when he met his roommate Dave McBride, a Lakota from the Pine Ridge Reservation in South Dakota.

> The program has yielded results for the high school students involved. Between 50 and 83 percent of students participating in CU Upward Bound continue on to a college career, CU Boulder Upward Bound Director Tanaya Winder said.

Following the 2015–16 school year, 65 percent of students enrolled in postsecondary institutions. Winder credits this in part to the high retention rate of high school students who return to the program year after year, which is usually above 90 percent.

While some students deal with homesickness, they also enjoy their time at camp and feel bittersweet about leaving. "I met some really awesome people while I was here in Boulder for the past three summers," said Locklear. "I would never have traded this experience for anything in the world."

Upward Bound programs exist across the country, helping low income and first-generation students feel capable in pursuing a college degree and succeeding in doing so. Involvement with the program can begin as early as a student's freshman year of high school, and students continue to receive support for five years after high school graduation.

"These students have such incredible resiliency, and they are brilliant, wonderful, and are going to be doing such amazing things in the future," said Assistant Director Héctor Ramírez (Craven, 2017).

Is it possible that Upward Bound would come to Bay Mills and operate a summer program for Native American students in this part of Michigan?

STEM Career Investigation Program

In one variation of linking high school students to employers, Nevada's STEM Career Investigation Program (SCIP) arranges six seminars voluntarily attended by students in grades 10-12. During each seminar, students hear presentations by scientists or engineers who "present their current research projects to the students and discuss future job possibilities for someone with their degree and area of specialization" (Nexus n.d.). Students who attend all six sessions earn a certificate of completion and have their name entered in a prize drawing.

Although this type of program certainly entertains the possibility of introducing students to an interesting array of people and the work they do in the EUP, it would be most effective if BMCC could follow up with participating students. In a brief exit interview, college personnel could find out if a student has an interest in attending another seminar series featuring different STEM career fields and if that student would like to visit BMCC's campus to learn about applicable degree programs. If the student responds affirmatively, the consultant could make necessary arrangements and communicate with the parents, thus increasing the likelihood that this student's visit would, in fact, take place.

Single Career Intensive Pathways

Instead of presenting an array of STEM career fields, some programs immerse high school students in summer-long intensives featuring one field. Honolulu Community College, for example, "offers students the opportunity to be engineers for a summer" (Nexus, n.d.) through a program called Summer Engineering Academy. Although students enroll out of an interest in engineering, program leaders slide much more into the program's agenda. Students also receive teachings on first-year college survival, and parents receive information about college applications and financial aid.

It seems evident that Honolulu Community College is using their summer engineering academy to present themselves to students and parents as a college that is willing and able to help them navigate the transition from high school to college. By making this service available, this college is also forging solid links between themselves and students who have self-identified as highly

interested in one of the college's degrees.

BMCC could mimic this by offering a summer intensive in one of its STEM degree fields. Just as Honolulu Community College does, BMCC could add value to each intensive by taking the opportunity to inform participants about BMCC's courses and prepare them to successfully handle their first college year.

Multi-Year Pathways

The Alaska Native Science and Engineering Program (ANSEP) is a dramatic effort to guide students toward STEM studies and careers. A quick perusal of its features illuminates its action-oriented protocol.

- Students enroll in Grade 6 and continue through college until they have real jobs.

- Each summer these young Alaskan students fly to Anchorage for ten days, during which they attend hands-on classes and complete challenging projects. Prior to leaving, they sign a pledge promising to complete algebra by the end of their 8th grade.

- Students in more advanced grades remain in Anchorage for longer periods each summer, during which they complete STEM classes and build complex machines. "95 percent of high school students move up a full class level every time they participate in the summer academy" (Johnston, nd.).

- ANSEP leaders note that in addition to making great academic strides, participating students develop a strong sense of belonging. They begin to believe that they truly do belong in the STEM environment.

- Finally ANSEP supports participating students as they enter college by helping with tuition payments and steering students toward research projects and paid summer internships.

Nine years elapse from the time a student begins Grade 6 until he/she completes a community college two-year degree. This marks the very long commitment any college would have to make if they wanted to emulate ANSEP, but imagine the strength of the relationships that BMCC could forge with participating students. Before BMCC undertook a similar program, it would have to consider its strengths, both in terms of its courses and its infrastructure. In which academic area does BMCC expect to grow so that it could offer a high-energy summer program boasting new challenges every year for participating students? What infrastructure assets (land, water, buildings) does the college own or have access to that would place students in enriching teaching-learning settings? How would BMCC source funding for such an extended program?

Connections without Classes

Not all programs designed to facilitate high school students' enrollment in college involve summer camps or classes of any type. The Lone Star College System (Lone State, n.d.), a consortium of seven campuses in and around Houston, operates a program called College Connections. Advisors make presentations to explain the college admission process, arrange campus visits, and go to high schools to talk with students.

Hawaii's College Horizons Program is another initiative that guides students through the college admissions program. Students attend for six days, but all activities focus on transitioning from high school to college, rather than specific careers (College Horizons, n.d.).

Workplace Pathways

Employer Connection

The State of Indiana operates a program simply called Career through which it demonstrates its commitment to "integrated workplace experiences in high school and college that help students apply their learning, connect with employers and develop marketable skills (State of Indiana, n.d.). This initiative incorporates tight partnerships between K-12 schools and local employers. In addition to workplace tours, job shadowing experiences, and interviews with career professionals, Indiana's Career program promotes partnerships between employers and colleges in which employers commit to hire students who "earn an industry-aligned postsecondary credential within a designated time frame after high school graduation" (College Horizons, n.d.).

It is quite likely that BMCC could forge similar partnerships with some area employers. In 2017, when BMCC personnel visited manufacturing worksites, employers made it very clear that they would eagerly consider job candidates who completed BMCC certification and degree programs in areas pertinent to their enterprises.

Another version of employer-student-college pathways is called Bridging the Gap between Education and Employment and is managed by Schools That Can Newark (STC Newark). This program features workshops about networking and provides opportunities for participating

students to practice job interviewing skills. Local employers explain global economy jobs skills, and students know they are hearing accurate information from informed people (Brick, 2016).

At a recent Bridging the Gap event, organizers observed that in the midst of their workshop's planned events, informal conversational moments between employers and students began happening and clearly held significance for students' future employment possibilities. Employers and students ate together and lingered to talk. Others struck up conversations throughout the day. In the end, event promoters concluded that face-to-face meetings between students and employers were going to hold long-lasting potential. It wasn't just that students got to meet employers; it was, also, that employers got to look future new hires in the face.

A similar reality could establish a sizable enrollment pool for BMCC. If BMCC arranged events similar to the Newark event, and if EUP employers urged students to obtain training in skills essential to their enterprises and to seek employment with them upon graduation, both employers and students would recognize BMCC as a valued connecting link.

Job Shadowing

Job shadowing places students on worksites where they work alongside one or more employees for a period that usually ranges from one day to one week. According to the terms of the job shadowing agreement, students may observe only one job or several jobs.

Job shadowing is just as effective when it causes a student to change his thinking about a potential career as when it confirms a career interest. Some years ago a downstate high school was contacting area employers to arrange the annual one-week job shadowing experience for juniors. One employer volunteered to take Tony, a young man who didn't think he wanted to go to college. This employer, who happened to serve on the school board, told the principal that he would make sure that by the week's end Tony would think college looked like a good option. Sure enough, after a week of boring chores in the least desirable parts of this manufacturing plant, Tony announced that he would be enrolling in college in the fall. Today he is a police officer.

During recent conversations with the team that conducted the BMCC high school career interest survey, EUP area high school administrators said they believe job shadowing can be highly beneficial to students and that they would welcome BMCC as a liaison, working on behalf of schools to find local employers who would invite students to job shadow. This appears to be a gap into which BMCC could easily step. This could become a three-way symbiotic relationship between the college and high schools and employers.

- High school **administrators** could see their students placed at a wide variety of work sites, some of which administrators might not know exist in the EUP.

- **Employers** would get an up close look at future new hires and, if they wished, could encourage them to train for certain types of work and apply for particular jobs when training was completed.

- As **BMCC** interviewed EUP employers about job shadowing possibilities, it would naturally grow a list of jobs and job skills. End-of-week interviews with employers could further inform BMCC's understanding of the local job situation. This, in turn, could inform future decisions about new programming.

The website, "Setting up a Job Shadowing Program" (Education Planner) is an excellent step-by-step guide with links to additional suggestions provided at every step. If BMCC decides to launch a high school job shadow program as a service to the community, this would be an excellent place to begin.

The "Complete Guide: Job Shadowing for High School Students" (Sarikas, 2015) offers tips that BMCC might eventually want to share with high school students who are about to job shadow.

STEM Enrichment Pathways

Some programs conceptualize STEM as an enriching gift to give to their community's children, including those who are showing no interest in STEM careers. Engineering for Kids states this clearly.

> Programs outside of school can help children to see that STEM is more than a class to finish. Having activities that show real-life implication of STEM can pull together the ideas presented in school and help to show how they benefit our society and even our world as a whole. Children can see that what they are learning now is pertinent to their future and the future of the whole world, creating an interest often lacking when learning new concepts that do not seem to carry real-world application (Engineering, n.d.).

At first glance, sponsoring STEM enrichment activities might seem far more lightweight than programs involving classes. However, fun activities can be memorable for students and much appreciated by parents. They certainly would serve as a legitimate way for BMCC to say to the community, "We know STEM." There is a cautionary note to be made regarding fun activities. For any one event, for any one participant, the sponsoring organization gets only one chance to do it right. BMCC should only consider creating enrichment activities if time, people, funding, and creative skills are sufficient to the task. College staff might begin with a small event for a relatively small number of students, self-critique relentlessly after the event, and steadily grow their capacity for holding highly appealing events.

Some years ago a dairy farm family in Michigan's Thumb decided to hold an event which they named Family Fun Day on the Farm. Preparations took months. First, they reached out to the professional dairy community, shared their vision, and gathered donated banners, posters, brochures, table settings, and give-aways. Next, the family established sites where guests could experience dairy farming, laid out hay ride routes from one site to another, wrote scripts, and planned lunch and snacks. On the final day, all walk-through paths were covered in sawdust. As guests arrived, family members directed traffic, conducted tours and demonstrations, answered questions, served food, and interacted nonstop with visitors. This event, which was held as a fundraiser for a private school, was exhausting but fun. However, the true meaning of the day was not manifested until later, often years later, as time and again people approached family members to thank them for that event and to report that long afterward they still remembered what they learned about dairy farming that day. Clearly this was an enriching

event that only enhanced the farm's community presence.

If done well, activities intentionally designed by BMCC to enrich EUP students' and parents' understanding of STEM could definitely enhance the college's reputation as a regional STEM educator.

Soft Skill Pathways

In her article titled, "The Top 12 Soft Skills Employers Seek," Penny Loretto (2017) explains that soft skills transfer from one job to the next and need to be exercised in any job setting. They include habits and attitudes, as well as verbal and nonverbal behavior.

1.   A positive attitude.

Beyond the obvious nice-to-be-around factor, a positive attitude can spread throughout a team and even an entire department. Due to its pervasive nature, a positive attitude can support employees who are facing challenges and leave them stronger for having faced the challenge together

2.   A strong work ethic.

This author opines that it is very difficult, if not impossible, for employers to teach strong work ethic and, therefore, employees simply must arrive on day one with this soft skill deeply entrenched.

3.   Excellent communication and interpersonal skills

Employees need to be able to not only tell, but also to listen. Many employees must do this at widely varying levels as they are asked to communicate with people who supervise them, people with whom they work daily or occasionally, as well as customers or clients.

4.   Problem-solving skills

In the workplace, problem solving can take on two natures, and employees need to know how to employ both. Sometimes an employee will have the knowledge to individually solve a problem and enact a solution. However, employees need to know when to seek others' counsel. Whether it's simple advice, a demonstration, or a protracted explanation, an employee well-trained in problem solving will quickly recognize his need and get help in a productive manner.

5.   Time management skills

Time management must be taught because it involves much more than merely staying on task. Employees who demonstrate this skill are able to analyze a task, break it into steps, sequence those steps, and finally determine the most efficient way to accomplish each step. Clearly, this takes practice. This practice should occur during a student's training years, not after he hires into his first job.

6.   Flexibility

At first glance flexibility might be viewed as an employee's ability to adjust to minor, unexpected changes to his day. However, that employee's ability and willingness to redirect his/her focus can have significant impact upon his company's ability to absorb changes in the marketplace. Resistance or even mere avoidance can delay change to the point that the employer cannot be proactive.

7.   Team function

Productive teamwork implies working side-by-side with colleagues, but that is not always the case. Quite often employees are asked to join colleagues for team planning, return to his/her own worksite and accomplish assigned work, and then contribute that part to the whole. Therefore, teamwork embodies many kinds of soft skills.

8.   Computer/technological skills

Specific computer/technological skills required for different jobs vary from data entry to written documents to presentations, and more. Therefore, even if students are expecting to work in jobs that don't appear to involve computer/technological work, they should, at least, include basic skill building in their education.

9.   Project management skills

Project management runs the gamut from keeping an eye on one's own efficiency to overseeing the work of others. Ideally, project management training will include motivation building and organizational change skill building.

10.   Self-confidence

A self-confident employee feels no urgency to gain stature by diminishing the status of others. Nor does he/she crave power as a substitute for confidence. The concept of team members growing together feels normal to a self-confident employee. In the education setting, teachers

and professors can be very intentional about building student confidence. However, students who grow confident in one instructor's presence will not necessarily carry those comforting feelings beyond the classroom. Therefore, in teachable moments, K-12 and college educators should openly discuss self-confidence and in ways appropriate to the age, help students internalize self-confidence.

11.   Ability to accept constructive criticism

Many employee supervisors do not simply evaluate performances, share evaluations with employees, and file them away. After providing constructive criticism they watch employees and note whether or not sufficient changes are made. They don't want to wait long. Ideally, students in training for future employment will be taught to expect constructive criticism, to recognize it when it comes, and to willingly and rapidly make changes.

12.   Strong research skills

Research skills can enhance an employee's value because that employee can bring new information to team meetings and to his/her own decision making process. This allows the employee to contribute uniquely to the employer's forward momentum and raises his/her visibility in the eye of the employer.

Additional soft skills

When BMCC personnel visited EUP worksites and questioned employers about soft skills, the most emphatic response was, "Teach them to come to work on time," followed by, "Teach them to leave their cell phones in their cars." Putting together these very basic soft skills with the twelve listed above, BMCC staff can see that teaching soft skills *to the point of student mastery i*s no small task. In fact, this task is so large that success would require collaboration and support throughout campus. Without absolute determination at every level from adjunct faculty through multiple offices up to the president, it probably won't happen.

Ideally, the list of soft skills would be printed and disseminated broadly. It should go to every policy meeting so that all applicable policies can be reviewed for their potential impact (positive or negative) on soft skills. During curriculum reviews and course planning sessions, the soft skill list should rest on the table alongside academic skills. Every instructor should be able to explain exactly how course policies, expectations, classroom discussions, and even content-driven activities will move students closer to soft skill mastery.

For BMCC students who arrive without strong soft skills, BMCC staff can conclude that neither home environments nor high schools were able to instill them. This puts the college in the position of being the last hope. In that scenario, BMCC's ability to embed soft skills into students' work ethos will affect not only students, but also the college's reputation among regional employers. After all, when employers consider a new hire's ability to not just do the

job, but also to be professional on the job, their thoughts will turn to that employee's career trainers, i.e., BMCC faculty and leadership staff.

An initiative as pervasive as this one would call for campus-wide evaluation. How might this be done? Consider these ideas.

- Each and every adult regardless of his/her job title could meet individually with a small number of students during the first week of each semester to talk each one through a soft skills self-evaluation rating form. This process could be repeated near the end of each semester to help students celebrate progress and renew commitments to this growth area.

- Soft skill concepts could be explained each fall during an orientation speech by someone in leadership. Students should understand that soft skill mastery will seriously affect their career progression and that at BMCC mastery of these skills parallels academic mastery.

- Every instructor, both adjunct and full-time, should introduce their course with an explanation of which soft skills will be practiced and evaluated during the course.

- Faculty meetings could open with five minutes of discussion about one soft skill with dialogue about what is working and what new approaches might be taken.

- Finally, whenever individuals are invited to campus to share their career story or speak to students about future career possibilities, BMCC staff could ask those speakers to incorporate the importance of soft skill performance in their presentations.

Part A: Closing Thoughts

This section has presented multiple programs which are being established for the purpose of connecting colleges to both high schools and employers. It is certainly true that Section A of this report describes only a tiny fraction of programs operating across the nation. If BMCC decides to step into the role of STEM coordinator for EUP students and employers, a broader search for unique approaches will be productive.
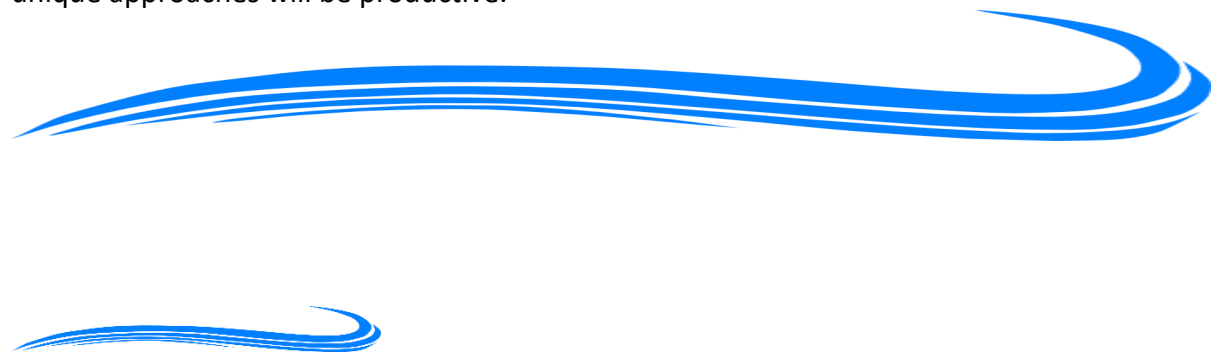
Part B: College Readiness

Remedial

Transition

And

Dual Enrollment Courses

Since this report is focused on forging links between Bay Mills Community College STEM programs, EUP students, and EUP employers, it would make no sense to discuss college readiness measurements outside the context of college-level STEM study and STEM employment. Hence, the basic question -

- Are graduating EUP students ready for college-level STEM study and rising toward STEM careers, and
- if not, what are the three entities – BMCC, EUP high schools, and EUP employers— going to do about it?

Clearing the Murkiness

As anyone knows who has ever used a shovel, sometimes the deeper you dig, the murkier it gets. This is certainly the case when we dig into college readiness, even when we narrow the conversation to the EUP.

- Does BMCC know how EUP high school educators evaluate their students' readiness to transition into postsecondary STEM study?
- Do EUP school administrators know how BMCC evaluates readiness for its introductory STEM courses?
- Do both groups know what measurement tools the other is using?
- Do EUP teachers know how their graduates handle first-year BMCC courses?
- And to complete the triangle, do EUP educators know what STEM skills employers seek, not only in those who will one day take certificates and degrees to their first job, but also in new graduates moving directly into the workforce?

Measuring readiness

In his article titled, "What We're Missing In Measuring Who's Ready For College," (M. Zinshteyn 2015) says that enticing young people to enroll in college "without gauging their ability to complete a degree" can leave them burdened with debt that they will find very difficult to repay. On the other hand, correctly gauging readiness opens up the possibility of finding students who are ready academically and just need a supportive push to step into college. Zinsheyn also reports a "sharp disagreement over whether test scores or high school grades are better predictors of college readiness."

<u>Test scores vs. grades</u>

The College Board, producer of the SAT, the ACT organization, maker of its well-known test of the same name, and proponents of the National Assessment of Educational Progress (NAEP) all claim that their data is solid and that certain scores are strong predictors of college success or failure. However, in 2014 William Hiss, former Dean of Admissions for Bates College led a study that examined test scores and high school grades as indicators of college grades and graduation rates. He concluded,

> The evidence of the study clearly shows that high school GPA matters. Four-year, long-term evidence of self-discipline, intellectual curiosity and hard work; that's what matters the most. After that, I would say evidence that someone has interests that they have brought to a higher level, from a soccer goalie to a debater to a servant in a community to a linguist. We need to see evidence that the student can bring something to a high level of skill.

> According to the data, if high school grades are not high, good testing does not promise college success. Students with good grades and modest testing did better in college than students with higher testing and lower high school grades.

> The human mind is simply so complex and so multifaceted and fluid, that trying to find a single measurement tool that will be reliable across the enormous populations of American students is simply a trip up a blind alley. I would never say the SATs and ACTs have no predictive value for anybody; they have predictive value for some people. We just don't find them reliable across populations (PBS News Hour 2014).

This paper is not tasked with arguing extensively for one viewpoint or the other. It simply points out that our three big players, i.e., EUP middle/high school educators, employers, and BMCC need to have this conversation. Illumination of EUP college readiness will be a win for everyone. Educators will know what employers need; employers will know what they might expect in a graduated job applicant; and both BMCC and high school administrators will know what a school-to-college transitioning student should know and be able to do. Ultimately, the big winners will be EUP students who will move from high school to college to career with greater likelihood of success.

Who Should Know What?

If BMCC pursues a role in EUP STEM leadership, what will it ask of (and give to) the other players just mentioned?

- How much and what should each member of this threesome understand about the others' wants, plights, concerns, and opinions regarding STEM education and careers?
- Should, could, and would each member offer assistance to the others?

To gather ideas, let's take a brief look at approaches being taken by other college –school – employer partnerships.

Dual enrollment

Dual enrollment is becoming the norm. It began as a perk for advanced students, but is now being considered for students who have been left out in the past.

> Dual enrollment has typically been targeted to more advanced students; indeed, several states have policies that limit student participation based on grade point average (typically, students must have a 3.0). However, the national and state focus seems to be shifting away from serving those who are already college-bound and moving, instead, toward the recruitment of disadvantaged, first-generation, middle-achieving, and other students for whom participation could be life-changing (Barnett, E.; Hughes, K. n.d.).

This is welcome news, since evidence suggests that dual enrollment encourages students to complete high school and enroll in college. While talking with high school educators, BMCC might explore the possibility of creating dual enrollment courses especially designed for remediation that would give English or math high school credit and replace first-year remediation courses at BMCC.

Transition

As BMCC considers establishing a Pathways initiative, it might take a long look at a three-year period that we will call *the transition* and define as the last two years of high school and the first year of college. This paper does not address the normal transition experienced by every graduating senior who leaves high school behind and perhaps moves to a campus some distance away. Our *transition* focuses on lifting students who are not prepared academically to handle college-level study. It extends a full year into college to accommodate students who need extensive support.

Educators have mixed views about the best way to transition underprepared students from high school to college. There are multiple patterns from which to choose. In some schools, students who score below ACT or SAT scores deemed "college ready" enter one or more remedial courses during their senior year in a last-chance effort to prepare for college.

Other schools place all students in the same senior-year classes and instruct teachers or assigned staff to provide extra support as needed. When a New York City study (Trimble, M. J.

2017) examined the effectiveness of high school math and English transition courses, the findings were inconclusive. Taking or not taking transition courses had little impact upon the likelihood that students would pass their first college-level courses. In fact, one question that arose out of these findings was whether students would have been better served by their school if they had enrolled in normal English and math courses.

In an article titled, "What We Know About Transition Courses," The Community College Research Center suggests that it is nearly impossible to compile a single description of a high school remedial course because there is no one standard for remedial course rigor, content, or training given to teachers of these courses. One reason is that high school educators often do not have clear ideas about what first year college instructors expect from freshman students. In other words, they are not completely sure how college ready performance looks in the high school classroom.

During the college half of the transition period, some colleges direct underprepared students to remedial (often called developmental) courses. Other colleges are trying a variety of schemes to keep underprepared students from dropping out. (Schaffhauser 2016) outlines several.

- Co-requisite courses which pair regular class time with required developmental hours
- Redesigning courses so that non-majors take courses within a discipline that are different from those required of majors
- Accelerated developmental courses that can be completed in a shorter amount of time
- Computer-assisted math
- Pairing developmental courses with workplace training
- Providing placement test preparation and more than one placement exam

Bridges

Bridge programs are offered during the summer or during the break between fall and spring semesters. They sometimes serve target populations. Some STEM bridge programs are entirely specific to one field within a defined field, while others deliberately expose participating students to a wide variety of fields. Bridge academic content may be augmented by confidence building activities and teachings about college norms and expectations.

Obviously, working with EUP high schools to design an effective transition program would require much study, thought, and collaboration with area teachers. If the end result was that EUP teachers understood clearly what BMCC expectations were, that alone would make this entire transition project worth all the time and effort it would require.

Part C: Pedagogy Pathway

Professional Learning

for

Engaged STEM Classrooms

Pedagogy Complexity

Across the EUP, many educators have partial understanding of STEM teaching and learning, but it is probably true that no one has deep knowledge about this region's entire P-16 STEM continuum. For the purposes of this paper, we focus on one segment of that continuum, i.e., the last two years of high school and the first year of college, a segment that we have previously labeled *the transition.*

As we consider how we might build pathways to increase success rates for EUP STEM students, we ask three questions.

1. How can EUP high school and BMCC instructors clarify what students are expected to know and be able to do at each stage of their STEM transition years?
2. How can these instructors develop STEM classrooms that uniformly train students in hands-on, problem-solving learning practices as preparation for employment?

3. How can this cohort unite to support STEM teaching and learning for each instructor and student?

We will look briefly at a few initiatives aimed at enhancing STEM success for teachers and students alike. Each one presents a very different approach so that together they hint at how complex, but intriguing STEM pedagogy is.

<u>Faculty Learning Program</u>

In January, 2018 a cohort of UC Santa Cruz and community college faculty launched a 10-month Faculty Learning Program (FLT). They began with a two-day in-person workshop and will continue through a series of online, interactive, synchronous sessions. Each participant will receive $1,500, funded through an NSF IUSE grant. Led by colleagues who have already completed a previous FLT, they will -

- develop STEM education expertise, including how learning happens and skills to facilitate student discussion and reflection,
- gain experience in using online technologies to develop their own instructional practice and support student learning, and
- redesign their STEM lectures to integrate new approaches into their teaching practice. (Center for Innovation in Teaching and Learning, 2018)

<u>Active Learning Inquiry Teaching (ALIT) Certificate Program</u>

At the University of Maryland Baltimore County's Faculty Development Center, a 2-yer program supports faculty in adopting evidence-based teaching approaches that foster retention of STEM majors and development of STEM.

Participating faculty –

- attend eight programs in Year 1 and four programs in Year 2,
- participate in mid-course evaluations,
- invite observations of their teaching,
- complete the Teaching Perspectives Inventory, and
- write end-of-program reflections

Participants have reported that their teaching was influenced by the program because their perspective of traditional teaching vs. active learning changed. This doesn't mean, however, that pedagogical changes occurred easily. Time to prepare new materials and concern about push-back were delaying factors (Hodges, L. n.d.).

<u>NERDS Science</u>

Nevada Educators Really Doing Science is a year-long program for Nevada science teachers of all levels. It is not held on any campus. Attendees go to a research center at Lake Tahoe where they participate in combined science research and professional development using the lake, meadows, forests, rivers, and streams. By first conducting science investigations and

documenting their own research experience, they understand how to revise their own teaching practice to make science more student-centered (Raggio Research Center for STEM education, n.d.).

Through this experience, teachers are reminded of what students experience in their classrooms when a new concept is taught and what a positive difference it makes when a concept is introduced in a meaningful context.

Organizational Change

At DePauw University two STEM faculty members received semester-long sabbaticals during which they learned to lead organizational change. Grant funding sustains their work for three years. With the help of department liaisons, they led their STEM faculty to agree upon one study topic. They are now guiding the faculty through this study via brown-bag lunch teachings and discussions (Roberts, J., n.d.). This is an example of learning being most effective when it is positioned in context. While faculty study their chosen topic and then begin to put their findings into practice, they are also learning to monitor their own ability to generate organizational change. This approach could have a notable effect upon EUP teachers, as it would remind them that student learners, also, can learn content while simultaneously monitoring their personal ability to grow in stature as a STEM problem-solving team contributing member.

STEM Problem Solvers

Tony Wagner from the Harvard Innovation Lab says that educators need to re-imagine school as a place where content knowledge is learned through projects and where projects are purposed with problem solving.

> Business leaders and economic thinkers are worried that today's students aren't leaving school with the skills they'll need to succeed in the workplace. Representatives from tech companies and hiring experts are looking for applicants who show individuality, confidence in their abilities, ability to identify and communicate their strengths, and who are capable of thinking on their feet (Schwartz, K. 2014).

Olin College in Massachusetts is so tuned into problem solving as a STEM learning vehicle that their application process includes visiting campus and working in groups on problem-solving projects. Students are taught to learn for the purpose of helping others. STEM students are urged to include business courses in their study plan in hopes that they will begin their careers equipped to not only research and design, but also to catapult knowledge into products and systems that will benefit society.

The above examples of STEM pedagogical change represent in a very small way the wide variety of efforts underway across our country to strengthen STEM teaching and learning. Following is an abbreviated list of change leaders' thinking about improving STEM teaching practice.

- To achieve a culture-shift in pedagogy, faculty need to feel secure in their institution's support. When they are asked to join initiatives designed to change their teaching style and methods, those programs must be aligned with institutional missions and goals.
- Besides teaching content, workshop leaders need to prepare attendees for the time it takes to prepare new materials, be specific during how-to training segments, and show how to respond to push-back from both students and doubting colleagues.

- Change requires transparent communication occurring at regular intervals. Think beyond official networks such as department staff and take advantage of informal networks of like-minded people.

- Pedagogy professional development leaders must recognize that when the effects of such training finally reach students, they will have a far greater impact upon students if participating faculty follow two tracks through their professional development. One track will be all about developing engaged learning classrooms to teach content. The other track will remind participants that students are much more likely to thrive if they feel supported by instructors who want them to learn and who care about them as individuals. Blending these two tracks together will be essential. Without this understanding, participants might make the mistake of giving up their old "sage on a stage" role only to become classroom COOs .

Might it be possible for BMCC to gather EUP STEM educators into a cohort, determined to prepare students for EUP careers? Could they unite around the goal of developing a three-year STEM curriculum that would transition students from high school into college?

As a means of practicing original research, could this cohort use BMCC assets such as Waishkey Bay, Waishkey Bay Farm land, nearby forests, and the Great Lakes Composite Institute building similarly to the way the NERDS program uses the Lake Tahoe area? Might this cohort's teacher and faculty members practice using STEM methods to solve problems supplied by EUP employers and then, in turn, develop a pedagogy that invites high school and college students to work on those same problems?

Two organizations might be especially helpful.

The National Alliance of Concurrent Enrollment Partnerships (NACEP) and its Michigan chapter (MICEP) both work to advance best practices. They each hold annual conferences. The 2018 NACEP conference will be in San Antonio in November, and MICEP members will gather in Midland for two days in July. Teams of colleagues will focus on collaboratively designing courses, so these might be ideal opportunities for BMCC and high school teachers to get

acquainted and develop mutually beneficial relationships.
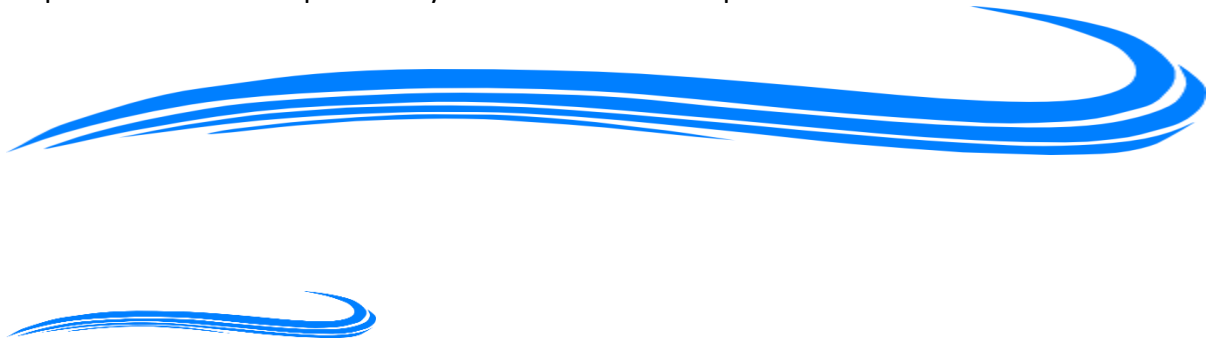
PART D: Community Pathways

Living Learning Communities

for

Student Retention and Graduation

STEM living learning communities gather together students of one STEM discipline, one field within a discipline, or even just one major within a field. Although they vary greatly in their details, STEM communities share one common mission – recruit students to STEM majors, retain them, and graduate them.

The phrase living learning community is a suitable moniker for these campus groups because it captures the essence of what they are meant to do.

- Create multiple study arenas and promote mastery of course content leading to successful course completion;
- Create a closely knit social group that supports members socially and emotionally;
- Function as a living entity with a name, a professional language, and consistent nurturing through shared food, conversation, and experiences.

Three living learning communities with varying missions are described below.

Academic and Social Support

Notice the deliberate inclusion of both academic and social support in Missouri State University's College of Natural and Applied Sciences community description below. The third item shows that its leaders want STEM student members to feel like budding scientists from the earliest days of their college experience. Events outside of the classroom allow professors and staff to keep their eyes on students and watch out for those who are struggling.

- This community of scholars is perfect for the budding scientist, mathematician, engineer, or pre-health professional.
- Students will participate in hands-on learning activities that allow them to utilize the skills learned in the classroom in fun and creative ways.
- Sponsored by the College of Natural and Applied Sciences, this community is provided with exclusive opportunities to engage with the Dean and professors outside of the classroom through one of our many signature events.
- Events include dinner with the president, meet professor get-togethers, going to area events related to science, etc.
- Finding internship and career opportunities will be fun as you explore your options with your peers in the STEM community.
- This community also helps students establish study groups for STEM courses and make friends along the way (College of Natural and Applied Sciences, n.d.)!

External Partnerships

Other campus communities function solely as providers of academic support and sometimes partner with entities outside of the college to provide this. One such example operates in Omaha.

> Avenue Scholars Foundation (ASF) is a private foundation local to the Omaha metropolitan area that serves struggling students. ASF students become part of a community of learners where they have access to community college courses and resources that are offered in a way that makes learning mathematics and science a way of thinking rather than simply as a course to survive. The University of Nebraska Omaha Office of STEM Education currently partners with ASF by providing both instructors for courses and for tutoring in math and science (Elliott, O. n.d.).

Set-Aside Housing

This third community, located at Boise State University, touches all the bases. Notice that it even includes set-aside living quarters for members with adults nearby.

> As a member of the STEM Education Living Learning Community, you'll find yourself among students who are challenging themselves to be better scholars and citizens in this community and in the world. The community is a special place where you can

develop closer relationships with professors and your fellow students. You will discover that education is about more than going to class, earning credits and getting a degree.

Education is a way of life. You'll learn through community discussions, social activities and service projects. You can develop long-lasting personal and professional connections while also focusing on your academic goals. And you'll have a whole lot of fun, too. Biking, canoeing and ice skating are just some of the many activities you'll take part in. While having fun you will discover that you also have been learning how to develop your intellect, leadership and character.

This community is designed for students looking to live and learn in interdisciplinary teams, especially those interested in the **IDOTEACH** program for education majors interested in science, technology, engineering, and mathematics. Participating in the community supports students for success in their coursework as well as information about the teacher education programs at Boise State. Students will learn about integrating STEM innovation with the study of teaching and learning, and build valuable professional experience to supplement their academic studies.

Participants live together with a Community Assistant and their Faculty in Residence. Multiple (optional) social activities are coordinated every week, plus a required weekly class meeting and associated assignments (Osguthorpe, R., n.d.).

Living learning communities at Concordia University Irvine cross discipline borders and focus on maintaining cohesive family-like environments. They intend to provide strong emotional support for their members.

In the fall of 2013, CUI launched four unique residential communities to create an experience where students and professors interact outside the classroom and students enjoy greater opportunities for learning right where they live.
The newly re-purposed residence halls, called Living-Learning Communities or LLCs, house 40 to 50 students who applied to live there based on a common interest: the Global Village is for students interested in global studies; Holos House is for students wanting to emphasize healthy living in body, mind and soul; WINGS is for students seeking greater help transitioning to college life; and CUI Bono is concerned with life's big questions.

In each living-learning community a professor and the professor's family are living among the students for the entire academic year, providing an element of family and personal interaction uncommon for most college students. The goal, says director of residential education and services Scott Keith, is for everyday interaction between students, professors and professors' families to provide a deeper, more transformative influence that goes beyond the classroom.

"Students are happier to be part of your institution if you are able to provide accessible ways for students and faculty to interact outside the classroom," Keith says. "An LLC

provides a place where students feel that they intrinsically belong and that engages them co-curricularly in an interest of theirs."

On and Off Campus

Living learning communities do not always maintain a consistent campus presence. Sometimes their mission immerses members in off-campus experiences. This community model might be a good fit for BMCC. Notice, also, that besides being devoted to STEM, the following community exists to mentor members of a particular population.

The University of Nebraska Omaha operates a 5-year program that combines summer camp community with post-camp school support and culminates with internships for community members.

> Started in 2012 as a partnership between Nebraska's metropolitan university and Omaha's leading organization dedicated to fostering the potential of young women, EUREKA–STEM! provides a unique educational experience focused on STEM education combined with physical recreation and personal development activities.

> Students participating in the EUREKA–STEM! program, also known as the Eureka! Teen Achievement Program, make a five year commitment including two years of camp at UNO during the seventh and eighth grade, which is then matched with three years of follow up support from Girls Inc. In their last two years with the program, participants are given an internship and paired with businesses and community partners who serve as mentors (University of Nebraska Omaha, n.d.).

Since BMCC students do not live on campus, it isn't possible to draw STEM majors together in shared housing. However, it might be possible for campus leaders to find ways to capture the essence of living learning communities. Social and professional events, study groups, interactions with STEM faculty beyond the classroom and conversations with non-teaching staff who show curiosity about their STEM interests would all contribute to STEM students feeling that they belong in the STEM world.

In the classroom, STEM faculty might strive to build communities specific to their discipline. One effective method involves telling students that they are student scientists, student engineers, student mathematicians, etc. Professors can help their students distinguish between thinking of themselves as students who are studying STEM course material and actually being student "STEMers."

Another effective way to help students believe in themselves as members of a STEM community is to teach them –

- their discipline's terminology

- their discipline's professional way of being while on the job
  - work ethic
  - team output typically expected in a certain field
  - how individuals in that field typically contribute to their teams
  - how teamwork is typically shared out to other teams and to supervisors
  - matters of precision, accuracy, clarity, timeliness, and personal appearance as they pertain specifically to various STEM work environments

If a professor consistently holds the classroom bar up to professional standards while firmly encouraging students to grab that bar, student self-confidence will grow until they feel like they fit in that professional community.

Pathway Conclusions

This paper was written to help Bay Mills Community College consider launching initiatives intended to position itself as a STEM leader for EUP employers, educators, and students. This paper can only serve as a discussion starter. Much research and many conversations would have to take place before decisions could be made. Ideally, those discussions would link BMCC to area students, administrators, teachers, parents, employers, and people across the country who are engaged in similar endeavors.

Perhaps BMCC's first duty as a STEM leader should be to make sure that all dialogue participants recognize that STEM is for every student. All students will not major in recognized STEM majors, but all students live on this earth where we experience global climate change, a global economy, as well as global health and nutrition issues. STEM certainly affects all of us who live in the EUP.

If BMCC finds ways to guide students to STEM program completion and on into STEM careers, it will, indeed, make a major contribution to its region and its people.

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