Annual Report to the LCCC Board of Trustees
Program Review Activity for the 2020-2021 Cycle (December 1, 2021)

Executive Summary

INTRODUCTION

The College experienced a fortunate transition from the first version of its online program review, which operated from 2014-2015 to 2019-2020 and completed 44 program reviews, to the new Pathway Review format, which started with the STEM Pathway and its six programs during the 2020-2021 cycle. The good fortune derived from the anticipation of STEM faculty, Institutional Effectiveness, and Institutional Research (IR) to develop a faculty task force in early spring 2020 to create a new self-study template that would serve the needs of LCCC's implementation of Guided Pathways 2.0. Meeting weekly over several months during spring and summer, a group of faculty members, institutional research staff, and administrators fashioned a self-study that presents standards expressing the institution's expectations for strong, positive Pathway performance and is organized around the Pathway pillars of 1. Help Students Choose and Enter a Pathway, 2. Help Students Stay on Their Path, 3. Clarify Paths to Student End Goals, and 4. Ensure That Students Are Learning. The distinguishing feature of this transition is that instead of having faculty members match their programs' activity to fit an academic criteria-based template, LCCC matched the self-study template to match the Pathways work that faculty would be doing.

Capturing the Essence of Program Collaboration That Favors Student Success

The order of the above pillar sections do not match the classic Guided Pathways sequencing because the faculty task force developed a division of labor for completing self-studies that has the Pathway Coordinator leading development of the two broader and more collaborative pillars (choosing a path and staying on a path) that benefit more from the joint effort of Pathway programs, while the two pillars (clarify a path and ensure student learning) favor specific program expression of performance; these are directed by individual program leads. This integrative, configuration of work has faculty of multiple programs, the Dean and Pathway Coordinator completing the first half of the self-study.

This central, more holistic perspective persuades the content production of individual programs to provide evidence of their collaborative activity that is a focus of the Guided Pathways model. This approach supports development of synergies that were less likely with the previous process where programs often went their own separate ways, which at times did not serve the best interest of the students who need to be retained and who need to complete. Now like programs do not compete as much among themselves as much as they gather as a team to compete against other Pathways.

Who Would be First?

The STEM Pathway, with a leap of faith in its highly-skilled faculty to pull this off, completed the first Pathway review self-study that includes the six programs of Biology, Biomedical Science, Computer Science, Engineering, Physical Sciences, and STEM. The institution designated this first Pathway Review cycle as a "start-up review." Most programs have five years of data to reflect upon when demonstrating performance. The STEM Pathway had zero years of Pathways-specific data. Yes, there were data available to show program performance of usual institutional expectations, such as enrollment participation or completion rates, but the institution had moved beyond this approach with Pathways to embrace a leading indicators approach that permitted programs to do formative assessment. If a program's completion rates drop significantly based on a cohort entering three years ago, what does it do now to help those students? However, if students are not completing college math and English within the first year or not completing twelve credits in their first semester, there are interventions that

can still help those students succeed. This is why much of the IR data presented in the self-study template was of the leading indicators type, thereby fixing the Pathway faculty's attention on the value of these kinds of data. That is a significant accomplishment of the first Pathways Review and explains why the institution is grateful for STEM's decision to be first.

CONCLUSION: WHAT HAVE WE LEARNED FROM THE FIRST PATHWAY REVIEW

Not all Pathways are created equal

Whereas the STEM Pathway programs are highly integrated, the Trades and Technical Pathway will likely produce a self-study where more content is program specific. For example, the STEM set four action plan goals with strategies that involve all six programs together. Each of STEM's six programs did not generate their own distinct action plan goals. However, other pathways may want to establish action goals distinct to specific programs as their structure varies from that of STEM's. This may be the case for the Trades and Technical Studies Pathway (TTS) currently completing a self-study for 2021-2022. Another example of STEM's collaborative Pathway structure is that a common semester course assessment does not involve a single program's students but multiple programs' students. However, TTS Pathway programs focus early on credit diploma completions and as such, programs like welding will contain mostly welding students (a few non-welding majors do take welding courses).

Relationship building is a new skill

Still, it is unremarkable that the STEM Pathway Review should demonstrate more centralized and collaborative narratives because this is how Pathway programs are supposed to perform. The clear distinctions among program performances as demonstrated in past program reviews is fading. This was evident with the sometimes shallow description of relationship-making from Pathway narratives and the frustrations expressed among peer-reviewers who hoped to see professional development experiences, course activity, and action planning that was highly discipline specific. The more mature Pathways better support a healthy education ecology whereby program faculty learn to develop collaborative behaviors and identify characteristics of successful relationship development, while peer-reviews learn to value the making and operation of these relationships. The College's Pathway Review standards present expectations for effective relationship building, e.g., Pathway Leadership Teams working with advisory committees. It will be exciting to learn over time if Pathways will lead to ecological balance points where all stakeholders win. With the STEM review, we made a good start at getting good at this. Through a collaborative Pathway Review process, we might learn how to do this better, and those lagging student outcomes will strengthen.

The STEM Pathway Review indicates that LCCC is achieving success in implementing Guided Pathways 2.0

Ideally, the College uses program review to accelerate its transition to becoming an effective Guided Pathways 2.0 institution. This Annual Report to the LCCC Board of Trustees indicates that a significant first step was taken to initiate an institutional Pathway program evaluation process. The current schedule for Pathway Review is displayed below in Table 5.

Table 5		**Pathway Review Schedule, 2020-21 to 2024-25**		
2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
STEM	Trades & Technical Studies	6 programs HSW^ & Business & Accounting & IT Pathway	Human & Public Services & Communication & Creative Arts	5 programs HSW^ & Agriculture & Equine

Program Review Activity for the 2020-2021 Cycle

Main Body of the Report

INTRODUCTION

The College experienced a fortunate transition from the first version of its online program review, which operated from 2014-2015 to 2019-2020 and completed 44 program reviews, to the new Pathway Review format, which started with the STEM Pathway and its six programs during the 2020-2021 cycle. The good fortune derived from the anticipation of STEM faculty, Institutional Effectiveness, and Institutional Research (IR) to develop a faculty task force in early spring 2020 to create a new self-study template that would serve the needs of LCCC's implementation of Guided Pathways 2.0. Meeting weekly over several months during spring and summer, a group of faculty members, institutional research staff, and administrators fashioned a self-study that presents standards expressing the institution's expectations for strong, positive Pathway performance and is organized around the Pathway pillars of 1. Help Students Choose and Enter a Pathway, 2. Help Students Stay on Their Path, 3. Clarify Paths to Student End Goals, and 4. Ensure That Students Are Learning. The distinguishing feature of this transition is that instead of having faculty members match their programs' activity to fit an academic criteria-based template, LCCC matched the self-study template to match the Pathways work that faculty would be doing.

Capturing the Essence of Program Collaboration That Favors Student Success

The order of the above pillar sections do not match the classic Guided Pathways sequencing because the faculty task force developed a division of labor for completing self-studies that has the Pathway Coordinator leading development of the two broader and more collaborative pillars (choosing a path and staying on a path) that benefit more from the joint effort of Pathway programs, while the two pillars (clarify a path and ensure student learning) favor specific program expression of performance; these are directed by individual program leads. This integrative, configuration of work has faculty of multiple programs, the Dean and Pathway Coordinator completing the first half of the self-study. This central, more holistic perspective persuades the content production of individual programs to provide evidence of their collaborative activity that is a focus of the Guided Pathways model. This approach supports development of synergies that were less likely with the previous process where programs often went their own separate ways, which at times did not serve the best interest of the students who need to be retained and who need to complete. Now like programs do not compete as much among themselves as much as they gather as a team to compete against other Pathways.

Who Would be First?

The STEM Pathway, with a leap of faith in its highly-skilled faculty to pull this off, completed the first Pathway review self-study that includes the six programs of Biology, Biomedical Science, Computer Science, Engineering, Physical Sciences, and STEM. The institution designated this first Pathway Review cycle as a "start-up review." Most programs have five years of data to reflect upon when demonstrating performance. The STEM Pathway had zero years of Pathways-specific data. Yes, there were data available to show program performance of usual institutional expectations, such as enrollment participation or completion rates, but the institution had moved beyond this approach with Pathways to embrace a leading indicators approach that permitted programs to do formative assessment. If a program's completion rates drop significantly based on a cohort entering three years ago, what does it do now to help those students? However, if students are not completing college math and English within the first year or not completing twelve credits in their first semester, there are interventions that can still help those students succeed. This is why much of the IR data presented in the self-study template was of the leading indicators type, thereby fixing the Pathway faculty's attention on the value of these kinds of data. That is a significant accomplishment of the first Pathways Review and explains why the institution is grateful for STEM's decision to be first.

STEM faculty were challenged further with writing content about their experiences operating Pathway programs when they had not run any before fall 2020. The specific programs were taking the Pathway cohort through a common first semester, meaning there would be little Pathway-related course-based data that would be distinct to individual programs. Necessarily, much of the STEM self-study focused on description of current processes and plans to develop future capacity for operating Pathway programs effectively. This initial STEM Pathway Review should confirm that at least one Pathway had made significant progress towards the Institution's adoption of Guided Pathways 2.0.

Ratcheting Upward the Sophistication of Data Use for the 2021-2022 Cycle

The two-year collaboration among faculty and IR Director to form and revise the Pathway self-study template has produced a dynamic, continuous interaction between data production and faculty feedback on data use that is generating a gradual ratcheting upward of LCCC's data use sophistication. The STEM Pathway Review faculty used static data displays that were embedded into appropriate sections of the Pathway Review template. The data centered on the Voluntary Framework of Accountability (VFA), which enables the institution to nationally benchmark its Pathway performance to that of other community colleges that participate in the VFA.

Each May, the Academic Standards Program Review Subcommittee Chair surveys a Pathway Review's faculty and peer-reviewers to gain perspectives on the review process. Based on the May 2021 faculty feedback, IR developed data dashboards and filters that delivered real-time VFA data for the 2021-22 cycle program performance analysis. Annually, groups of faculty members are introduced to these dashboards and additional static data displays as a result of the roles they played as self-study developers or self-study peer reviewers. This continuous interaction of the IR Director and the annual streams of faculty members serving as data users and then as providers of feedback on data resources is resulting in an annual ratcheting upward of data use sophistication. This interactive collaboration generates better dashboards with more effective filters that deliver more refined real-time data for more and more targeted decision making. These improved resources distribute outward from Pathway Review experiences and work to impact all Pathways' research for continuous improvement of Pathway performance.

Making Pathway Review More Diagnostic

For this first Pathway Review, AVPIE staff developed a heatmap chart to strengthen data visualization that accelerates rapid analysis of Pathway program strengths and weaknesses (see Heatmap Chart Depicting Density of Rating Ranges in section four, p. 10). This diagnostic tool assisted the STEM Pathway Coordinator and program leads to more quickly guide resources towards those self-study sections that required responses to peer-review feedback. These responses affect the second round of peer-review ratings. It also assists or confirms the Pathway's action planning for building future capacity.

Verification of Pathway Review Alignment to Board of Trustees CQI and Academic Program Review Policies

Policy 1.1.4 states that *The Laramie County Community College Board of Trustees is committed to creating and sustaining a culture of continuous improvement in which evidence of achievements in student learning, and institutional effectiveness and efficiency are regularly collected, analyzed, and shared for the purpose of continuous quality improvement.* More specifically, Policy 10.2 articulates the Board's four program review objectives:

1. Generate meaningful knowledge about how well academic programs are contributing to the attainment of the College's mission;
2. Provide for regular evaluation of each academic program with enough frequency to establish a cycle of planning and assessment for continuous improvement;

3. Incorporate objective input, process, and outcomes components to provide a holistic perspective of programs' current efficacy and guide planning for improvement; and
4. Lead to the development of actionable and appropriate plans for program improvement.

Summary of the STEM Pathway Review Self-Study, 2020-2021

Readers of this report are encouraged to review the STEM Pathway Review Summary displayed in Appendix A to glean more detailed information about the Pathway's, listing of program achievements, mission and values statements, its student learning and operations assessment planning, self-study SWOT findings, and action plans that the Pathway and its specific programs will be implementing over the next five years.

OUTPUT OF PROGRAM REVIEW

LCCC's program review process generates output characteristics that support the Board's four objectives. Many of the characteristics also serve as evidence items that demonstrate institutional compliance with regional accreditation criteria. The majority of this annual report provides description for the below eleven output characteristics.

LCCC Program Review Output Characteristics

1. Demonstration of program alignment with LCCC mission
2. Identification of program values and operationalizing those values for guiding program activities
3. Program awareness of and responsiveness to stakeholder needs
4. Rubric ratings of self-study sections that reveal Pathway-level features of success and areas for added improvement
5. Evidence that programs are collecting and analyzing KPI and VFA data to verify current practices and to inform planning for continuous improvement
6. Improvements that result from implementation of pathway action goals originating from a previous program review
7. Faculty engagement in program review
8. Identifying and sharing best practices of Pathway program performance
9. Developing review findings into a SWOT analysis that affects action plan goal development
10. Regeneration of the Pathway Review: Developing faculty-informed improvements to the review process
11. Program follow-up action planning intended for strengthening areas that peer-review identified for added attention

1. Demonstration of program alignment with LCCC mission

The six STEM Pathway programs share a common mission statement. Its focus is to transform student's lives by immersing students in science, technology, engineering and mathematics experiences, which not only provide them the foundational knowledge and skills needed to be successful in STEM disciplines, but also inspires and excites them to pursue their desired field of study with a passion that transcends the classroom learning environment. This is accomplished through multiple high-impact practices, which include: field experiences, research opportunities, industry and work-place visits, internships, high-tech equipment and laboratory settings, and instruction from world-class faculty.

The STEM Pathway's primary purpose is to successfully provide student engagement and preparation for college success, transfer opportunities, workplace preparation, and community engagement. For example, student engagement and college preparation begin when student interested is declared in the STEM Pathway. Working together with admissions representatives and advisors, the Pathway Coordinator ensures that incoming students are connected within the Pathway immediately and are aware that they have a support team in place

to guide them through their journey at LCCC. This also includes getting to know instructors and staff with whom they will be working throughout their program completion. Hosting "Kick-Off" events within the Pathway where students can meet faculty and staff and get a glimpse into what classes and lab settings will look like, is one of many examples where students get welcomed into the Pathway.

2. Identification of program values and operationalizing those values

Pathway programs provide listings of their values, describe how they share them with stakeholders, and demonstrate how these values guide program activities. Values are essential for establishing Pathway identity; they drive Pathway activity from year to year, and consistent attainment of these values determines Pathway quality.

a) The six Pathway programs share the below value statements in common.

- The STEM Pathway promotes personal and professional growth through the development of scientific reasoning and problem solving. Within their chosen programs, students acquire the specific knowledge and skills necessary to be successful professionals within their discipline and either move on to a four-year institution and gain a baccalaureate degree or gain employment in related fields.

- To provide courses that serve the STEM needs of students and their ultimate success in other LCCC Pathways (e.g., Agriculture & Equine, Business & Accounting, Communication & Creative Arts, Health Sciences & Wellness, Human & Public Services, and Trades & Technical Studies).

- To be a conduit to the community for STEM issues, skills and knowledge. This is done through various community outreach, collaborations and partnerships (e.g., our collaborations with Cheyenne and Laramie County GIS Coop, LCCC BioBlitz, Laramie County Conservation District, Laramie County K-12 Schools, Wyoming FFA and others). Most importantly it is through building a sense of trust and presences in the community so that its members see the STEM Pathway at LCCC as an important resource within the community.

b) The Pathway shares value statements across internal and external stakeholders.

The STEM Pathway plans to deploy strategies to foster the development of relationships between students and other individuals (e.g., faculty, LCCC resources, community and business members, etc.) through collaborative efforts.

Collaborate with LCCC's Foundation in cultivating relationships.

- Attend all Foundation events
- Volunteer at Foundation events
- Meet with donors
- Meet with Foundation Development Officer quarterly to strategize
- Provide Foundation with Pathway information and needs for endowments

Participate in community events, attend meetings, and serve on committees in collaboration with local and regional business and industry.

- Business council
- Cheyenne LEADS
- Frontier Days
- Local, State and Federal Government
- Wyoming State FFA Convention
- Cheyenne and Laramie County GIS Cooperative

c) The Pathway aligns its value statements with internal and external stakeholder needs.
The Pathway seeks guidance and feedback from groups mentioned in the section above, as well as others, which speak to both internal and external stakeholders. The formation and maintaining of a STEM Pathway Advisory Committee (STEM PAC) functions as our most formal alignment with our stakeholders. This body encompasses a wide variety of professionals, community members, university representatives, students, and STEM faculty and staff. We look to the STEM PAC to help drive our decisions on curriculum, program development, essential student experiences, and other community outreach that keep the STEM Pathway relevant in providing our students with a strong preparation in STEM fields as they move on to their next stage in academics or career placement.

d) The below example demonstrates how the STEM Pathway value statements are being used for guiding program activities.
The below examples for developing Pathway events align with the first and third values statements listed above for promoting personal and professional growth as well as community outreach and collaboration.

Examples of how this is put into action:
Pathway Day I (Exploration): The STEM Pathway Coordinator in conjunction with the other Pathway Coordinators center this event around program and Pathway exploration in the SU/FA semesters. Immersive and collaborative events are organized to establish the feeling of belonging and support as students are welcomed to LCCC and to their Pathway.

Pathway Day II (Celebration/Redirection): The STEM Pathway Coordinator in conjunction with the other Pathway Coordinators utilize the Mid-End of Fall semester to host an event which will serve as a celebration of goals and checkpoints achieved, and create opportunities for students to connect with the Coordinators, Advisors and Faculty if they need to explore a different path.

Pathway Day III (Career Opportunity Day): The STEM Pathway Coordinator in conjunction with the other Pathway Coordinators collaborate with career services and industry partners to prepare, connect, and onramp students into the workforce or into a transfer program to ensure the transition after LCCC is supported. Faculty, Admissions, Advising, Student Services and all staff are encouraged to participate in these essential events to personalize the experience for students.

3. Program awareness of and responsiveness to stakeholder needs

Responsiveness to stakeholder needs is a central theme for institutions implementing Guided Pathways 2.0. Multiple sections of the Pathway Review self-study directly articulate institutional expectations for effective stakeholder responsiveness as part of the “standards” component (see below Table 1). The STEM Pathway expressed its compliance to these standards in its self-study narratives as it described its current and planned processes for generating and responding to stakeholder feedback. It mentioned many of the more effective tools for collecting stakeholder feedback such as: 1. Advisory councils, 2. Special accreditation criteria, 3. Professional guidelines or standards, articulation meetings, stakeholder surveys, and 4. community association interactions.

Table 1	**Stakeholder Awareness and Responsiveness**
I.E.2: Programmatic Responsiveness	
Standard: The Pathway systematically matches its academic programming to current job and transfer opportunities, while providing programs with resources to respond to the Pathway's strategic guidance Guideline: Describe the Pathway's system or data gathering process used to inform Pathway-level decision making on programmatic change that effectively responds to current job and transfer opportunities.	
IV.A.4: Relevancy of the Program's Curriculum	
Standard: The Program sustains relevancy in its curriculum using strategies such as aligning to professional standards or best practices, and responding regularly to stakeholder needs.	

At the STEM Pathway level (I.E.2 Program Responsiveness) STEM programmatic decisions will also be guided through the input and collaboration of both internal and external stakeholders such as: students, faculty and staff from other Pathways, local K-12 schools, local universities, friends and donors of the program, and others in the STEM professions and industry. One of the most important pieces to this will be the work of the STEM Pathway Program Advisory Committee (PAC). This committee, which is being formed and will have its initial meeting in the spring of 2021, will be made up of a group of 12-15 members from various STEM professions and academics. The STEM PAC will be the most effective means of staying current with job and transfer opportunities for our STEM students moving forward.

STEM Pathway Program Advisory Committee (work on assembling this team is currently in progress)

- **Hydrologist** USGS
- **Engineer** WYODOT
- **GIS Coordinator** Cheyenne MPO
- **Geospatial Technology Supervisor/Biologist** Wyoming Game & Fish Dept.
- **LCSD1 Science Coordinator** Laramie County School District #1
- **Doctor of Optometry/Owner** A New Concept Optical
- **Associate Director** Wyoming NASA Space Grant Consortium
- **Director, Botany Professor** UW, Wyoming Research Scholars Program
- **Director** Wyoming Public Health Laboratory

*Plan is to add 3-5 more members with representation from University of Northern Colorado, Colorado State University, and a local/regional computer programming and solutions company.

At the Pathway specific program level (IV.A.4: Relevancy of the Program's Curriculum), STEM pathway courses utilize a curriculum (i.e., MCORS) aligned to the professional standards of the disciplines and programs that it serves. One specific example of how this is applied is the Zoology department as courses in this area are requirements or electives in both the Biological Science and Biomedical Science degree pathways. The Zoology Program uses a curriculum aligned to the national HAPS (Human Anatomy and Physiology Society) standards. HAPS is a national-level organization that develops a standard curriculum to be utilized by both community colleges and four-year universities, and HAPS members are eligible to receive training and accreditation by the society. This approach is also utilized in Chemistry with implementation of standardized tests provided by the American Chemical Society.

In addition, the STEM pathway faculty interact with their various stakeholders regularly (through individual connections and our STEM advisory committee) to gather information on the needs our courses must meet. For example, the STEM faculty broadly interact with their counterparts at the other WY community colleges and the University of Wyoming through annual articulation meetings. Furthermore, Zoology faculty also consult with internal stakeholders such as the program directors of the various Health Science programs offered at Laramie County Community College (dental hygiene, nursing, radiography, sonography, physical therapist assistant) to ensure that the introductory courses in Anatomy & Physiology (ZOO 2010, ZOO 2015, ZOO 2020, ZOO 2025) meet the needs of students applying to these programs.

To obtain student stakeholder feedback on learning effectiveness, STEM pathway programs also regularly rely on the use of standardized testing to evaluate the success of student learning. Two examples of this are the *Scientific Literacy Concept Inventory Test* and the *Modified Lawson Classroom Test of Scientific Reasoning*. Each of these can be used to evaluate student learning performance relative to MCORS and specific program competencies (e.g., scientific literacy) and can be used to compare findings to national performance results. Results from these tests are used to evaluate instructional methodology and to aid in the development of new instructional content.

The STEM Engineering program maintains articulation with UW, which is currently being modified to articulate to four different Bachelor of Science degrees at that institution: Chemical Engineering; Petroleum Engineering; Energy System Engineering; and Civil Engineering. Even though community-college engineering programs are not traditionally subject to accreditation by ABET (Accreditation Board for Engineering and Technology), quality four-year programs in engineering must be accredited by ABET. LCCC's Engineering program responds by taking ABET's requirements into consideration.

In addition, the STEM Pathway included stakeholder responsiveness among its SWOT items, recognizing it must address a SWOT weakness: needing to develop a clearer understanding of the role of the advisory committee. Additionally, it realizes that there is an opportunity for the Pathway to strengthen business and industry collaboration within the community.

4. Rubric ratings of self-study sections that reveal Pathway-level features of success and areas for added improvement

LCCC uses a program review rubric to rate Pathway performance on institutional standards (see Appendix C for complete Pathway rubric ratings of all self-study sections). Rubric ratings over level three, using a 0 to 4 scale, signify that a program has met the academic standard for a self-study section, so ideally the institution should have aggregated ratings at 3.00 or above for all sections.

By aggregating a Pathway's individual program ratings, a Pathway-wide perspective is obtained (see Table 2 below). After multiple review cycles, an institution-wide view of Pathway performance strengths and weaknesses will emerge. Currently though, there is just one cycle of ratings available that reveals a single Pathway's performance. The heatmap chart displayed below provides a more refined method of locating self-study sections that may require action planning for improving performance. The blue-font text designates two low performing sections. The STEM Pathway acknowledges this finding in its SWOT analysis when it designates "Student Learning Assessment" as a weakness item. Alternately, the heatmap chart also displays strengths as displayed by the orange-font section for operational assessment planning. Institutional Effectiveness provides complete heatmap charts to the Pathway coordinator to assist performance analysis.

The fall 2019, the HLC Comprehensive Quality Review site visit team report identified the inconsistency of academic student learning assessment planning as an area for additional attention. The Covid-19 event, which

began in February 2020, further delayed development of the institution's assessment planning efforts. The institution has not had a common student learning assessment process for the nearly two years. Many higher education institutions experienced a similar learning assessment lag because of Covid-19. However, this created a challenge for the recent STEM Pathway and the more current Trades and Technical Studies Pathway, which is currently preparing its self-study.

Table 2 STEM Pathway-Level Peer-Review Self-Study Ratings for 2020-2021

Program Review Self-Study Cycles	2020-2021	2021-2022	2022-2023	2023-2024
Number of Pathway Specific Programs	6 programs Averaged*	programs averaged	programs averaged	programs averaged
I. GENERAL PATHWAY OVERVIEW				
SECTION AVERAGE	2.97	0.00	0.00	0.00
II. HELP STUDENTS CHOOSE AND ENTER A PATHWAY				
SECTION AVERAGE	2.95	0.00	0.00	0.00
III. HELP STUDENTS STAY ON THEIR PATH				
SECTION AVERAGE	3.02	0.00	0.00	0.00
IV. CLARIFY PATHS TO STUDENT END GOALS				
SECTION AVERAGE	3.00	0.00	0.00	0.00
V. ENSURE THAT STUDENTS ARE LEARNING				
SECTION AVERAGE	2.86	0.00	0.00	0.00
VI. CONCLUSION: SWOT ANALYSIS				
SECTION AVERAGE	3.00	0.00	0.00	0.00
PROGRAM REVIEW AGGREGATED RATING FOR THE REVIEW CYCLE (Completed by Institutional Effectiveness Staff)	**2.97**	**0.00**	**0.00**	**0.00**

*Peer-review rubric ratings from six programs were averaged (STEM, Biology, Biomedical Sciences, Computer Science, Engineering, Physical Science). All individual ratings of a peer-review committee within a section are averaged to form the section averages.

Heatmap Chart Depicting Density of Rating Ranges

Each column of ratings represents one of the six STEM programs

C.	VERIFYING STUDENT LEARNING						
1.a	The Program uploads its current curriculum map and provides a summary of how faculty members use it to document curriculum changes over time, describe students' learning development over time, and manage its annual assessment planning activity.	2.57	3.00	2.20	1.60	2.86	2.00
2.a	The Program lists and describes the evidence (program artifacts, rubrics, certifications, surveys, etc.) and processes utilized to assess program-level competencies and resulting program continuous improvement.	3.14	2.86	2.80	2.20	2.86	2.17
2.b	Describe the short-cycle process utilized to continuously document Program changes/improvements in student learning over time to support evidence gathering.	3.00	3.00	3.00	2.40	3.14	2.67
2.c	The Program describes how it evaluates its intentional student engagement in the Program and field using data resources such as CCSSE/SENSE data and others, if applicable.	3.00	3.00	3.00	2.40	3.14	2.67
2.d	Data-Embedded Area						
3.a	Using the displayed learning assessment plans (imported from Campus Labs planning module), Programs explain how they annually maintain assessment planning, discuss some of the changes made to planning over the review cycle based on data reporting, and provide one example of an improvement that emerged from planning efforts.	3.00	3.14	2.60	1.60	2.00	2.50
4.a	Using the displayed operational assessment plans (imported from Campus Labs planning module), Programs explain how they annually maintain assessment planning, discuss some of the changes made to planning over the review cycle based on data reporting, and provide one example of an improvement that emerged from planning efforts.	3.29	3.14	3.20	3.20	3.00	3.33
5.a	Programs summarize their performance on achieving student academic success and provide supporting evidence such as course success rates, fall-to-fall retention rate, completion rates, percent of students proficient at program learning competencies, and others.	3.00	3.00	3.00	3.00	2.14	3.00
5.b	Data-Embedded Area						

Ratings 2.50 or below

Ratings between 2.51 - 2.80

5. Evidence that programs are collecting and analyzing KPI and VFA data to verify current practices and to inform planning for continuous improvement

Evolution of Data Use to Serve Pathway Needs:

One of the reasons for considering the STEM Pathway Review as a "start-up" review was the scarcity of Pathway performance data; the STEM Pathway's first semester of operating Guided Pathways 2.0 was fall 2020. No Pathway-specific trend data were available. While there were some KPI student outcomes data available, such as transfer matriculation or completion rates, the new Pathways model required use of the American Association of Community College's Voluntary Framework of Accountability (VFA) data because it offers leading indicators such as "completion of math and English in the first year" or credit accumulation expectations such as "completing 12 credits in the first semester" and "24 credits by the end of the second semester". Pathway faculty can act on these data in a more intentional way with timely interventions than is possible with lagging indicators such as completion rates. VFA data are embedded throughout the Pathway Review self-study, but much of it did not apply to STEM's fall 2020 experience. A primary value of these data for STEM was its capacity to establish benchmark levels from which to compare its future Pathway performance and from which it could set future performance goals. See *Summary of the STEM Pathway Review Self-Study*, section H. Abbreviated Summary of Program Data in Appendix A to view a more complete set of VFA Pathway data as they appeared in the Pathway self-study template.

STEM Pathway Data Usage:

The STEM Pathway utilized analysis of its data resources to inform its SWOT analysis and to help STEM form its action plan goals. For example, the following SWOT items relate to data informed findings.

Strength:	Individual Student Course Success
Weakness:	Degree Completion
	Transfer Rates
	English Completion in a Student's First Year
Threat	Continued Enrollment Problems Post Pandemic

In addition, STEM's data monitoring for success informed development of the following action plans.

Pillar Two: Increase success rates for college-level Math by 15%-20%

Pillar Three: The STEM Pathway, as a collection of six programs, shall increase graduation rates by 20%.

The Pathway Review process revealed frustrations on the part of STEM faculty and peer-reviewers with the lack of data for supporting student transfer success and with the weak collaboration from the University of Wyoming to develop program-specific outcomes such as first semester GPA data. The student outcomes transfer data revealed low percentages for both degree transfers and non-degree transfers, but these are lagging indicators that do not inform timely action. Faculty revising the Pathway template over the summer added a new guideline (see Guideline b. below) for the student transfer self-study section that places emphasis on early program-grown methods for supporting transfer that they control, and they can measure.

b. Guideline: Transfer programs provide evidence of how they support transferring students by specifically providing student experiences that support an intentional plan for transfer. Some examples might be preparing students for online education so they have options to transfer to online programs and/or providing opportunities for students to learn about transfer programs.

Improvements for the 2021-2022 Review Cycle:

Faculty responding to faculty feedback provided in May 2021, worked over the summer to install improvements to data resources. IR responded to recommendations to produce more data dashboards in the self-study template and add more VFA data resources on the IR virtual site. Orientation sessions for Trades and Technical Studies Pathway programs included more emphasis on data usage and for interacting with self-study dashboards. In addition, significant developments are taking place for production of job market data with the emergence of the U.S. Census Bureau's effort (Post-Secondary Employment Outcomes PSEO) to partner with states like Wyoming for leveraging data resources that provide a fuller picture of post-graduate activity in the workplace (e.g., UI state data and federal IRS data). LCCC signed a PSEO MOU as part of a Wyoming Commission effort and assigned an LCCC representative (VPAA) to work with the Commission to develop the EMSI Analyst tool for aligning higher education curriculum to job skills.

6. Improvements that result from implementation of Pathway action goals originating from a previous program review

There is considerable difference between the existing STEM Pathway performance outcomes and its closest program grouping of Natural Sciences, which was reviewed as a program in 2015-2016. However, two of the closer outcomes include course success rates and credits to completion. Its 2015-2016 action plan goal one acknowledged that its students averaged 83.6 credits to graduate and sought to decrease this to 70 credits. Although it was too early to develop credit hour totals for STEM programs, the 2020-2021 Course Catalog shows that, except for Physical Sciences, programs' credit hour totals ranged from 63 to 68 credit hours, which demonstrates improvement.

In addition, Natural Sciences realized a course success rate of 61.8 percent for 2014-2015 and sought to increase this to 65 percent. The 2018 cohort Credit Hour Success in Year One for the STEM Pathway stands at 76%. For a like assortment of programs in 2014-2015, the graduation rate for concentrators (majors) was 3.23 percent and the Natural Sciences program sought to increase this to 10 percent with its action planning. The Two-Year Outcomes by Pathway show STEM with a 11 percent student graduation rate (earning any credential). Although these comparisons are somewhat tenuous, it is interesting to ponder the two views and the considerable variance from the earlier 2014-2015 data performance and the higher performing 2020-2021 levels. For a complete listing of previous action plan goals for current STEM programs see Appendix A, section M of the STEM Pathway Review Self-Study.

7. Faculty engagement in program review

Using a robust peer-review method helps spread the learning about continuous improvement methods and robust data usage across the College's Pathways. In the future it will continue to strengthen the organizational learning about Pathway quality expectations.

This common Pathway review CQI platform blends the perspectives of faculty in diverse roles. For example, there is a specified number of faculty members writing self-studies each year who share how their specific programs develop quality. Another group of faculty members approach programs externally from the perspective of peer reviewers; they learn about programs outside their own Pathway during the review experience, while using review feedback to sharing their experiences of how quality is developed within their own respective programs. Some of the peer-review faculty members are part of Pathway programs scheduled for program review in the following year and take the perspective of studying the review process as a professional development opportunity.

The Academic Standards Program Review Subcommittee oversees peer-review activity. Its 2020-2021 membership included administrators, faculty, and staff members (see Table 3 below). These 19 peer-reviewers exchanged online comments with the six STEM faculty leads who developed self-studies in 2020-2021, resulting in a total of 25 LCCC deans, faculty and staff engaged together in this CQI initiative.

During spring 2021, peer reviewers generated 1,588 peer-review feedback comments for an average of 265 comments per program (see Table 4). Programs routinely respond to peer-review feedback comments/questions with additional information narratives and by uploading supporting documents to validate claims.

Table 3 Academic Standards Committee: Program Review Subcommittee, 2020-2021 Cycle	
Position Area	**Name**
1. Faculty Member-Arts & Humanities	Kristin Abraham
2. Faculty Member-Business, Agriculture & Technical Studies	Caleb Perriton
3. Faculty Member-Health Sciences and Wellness	Sheridan Hanson
4. Faculty Member-Math and Sciences	Lisa Taylor
5. Academic Dean	HSW Starla Mason
6. Academic Dean	CCA Damien Kortum
7. VPAA	Kari Brown-Herbst
8. One Librarian	Maggie Swanger
9. ASC Subcommittee for APR, Chair	Erin Nitschke
10. Chair of the SLA Committee	Marie Yearling
11. Student Services Representatives	Andrea Clubb
12. Student Services Representatives	DeWayne Saulsberry
13. Administration and Finance Representative	Unrepresented
Faculty Members with a Role in Developing Next Year's 2020-21 Program Review	
Automotive Technology	Robert Lafaso
Diesel	Chad Parsons
Electrical	Suzie Lemaster
Industrial Systems Tech. and Industrial Maintenance & Plumbing	David Curry
HVAC	Brandon Geisler
Welding	Sam Graham
Wind Energy	Steve Hrkach

Table 4 Faculty Engagement in Peer-Review Activity, 2020-2021		
Schools	**Programs**	**Reviewer Feedback Item Totals**
M&S	1. Biology	377
M&S	2. Biomedical Sciences	285
M&S	3. Computer Science	183
M&S	4. Engineering	272
M&S	5. Physical Science	198
M&S	6. STEM	273
Total Review Comments for 2020-2021		1,588*
Per Program Measure for 6 Programs		264.6
*Note: The 2020-21 cycle had six peer-review groups each rate Pathway sections I-III of the six STEM programs. In future years, just one peer-review group will rate the Pathway sections I-III as these sections are common to all Pathway programs. Therefore, it is likely the per program number of review feedback items should decline in the 2021-2022 cycle.		

To provide added insight into what these program review dialogues look like, one example from the STEM Pathway program is displayed below. Often the dialogues result in deeper faculty self-evaluation of program actions, encourage stronger descriptions of the processes used to develop quality, and support more thoughtful development of action planning.

I.A.2 Pathway Program
Standard: Each of the Pathways has an effective Pathway Program for supporting the pathway and its specific programs.

Guideline: Describe how the Pathway Program provides academic support to the Pathway and the specific Programs in the Pathway.

Original Program Self-Study Narrative
The Pathway Leadership Team (PLT) is a formal, team-based configuration for the coordination of student-focused activities, conversations, and actions that require the active involvement of individuals with unique perspectives and roles within an individual Pathway. The primary purpose of the STEM PLT is to monitor and ensure student involvement in, and progress through, the Pathway leading to completion of a degree or credential at LCCC. Other responsibilities include coordinating community-building activities, successful recruitment and onboarding of students into a Pathway, and general management of issues with the successful operation of the Pathway components. This requires frequent, planned interaction between the team of individuals to include the Pathway Coordinator, Pathway Advisor, and School Dean/AVP of the ACC. Pathway Leadership Team activities are coordinated by the Pathway Coordinator, and teams will meet at least bi-monthly.

- Coordinate and facilitate meetings and work of the specific Pathway Leadership Team (Dean, Pathway Coordinator, Pathway Advisor(s))
- Sustain process continuity with PLT (e.g., conducting enrollment management, curriculum management, resource development, program-level assessment)
- Develop effective communication throughout Pathway with PLT

Internal Review Comments
--Peer Reviewer One: The section offers a nice description of how the PLT is designed to function as a program resource for supporting the Pathway program and specific programs. This section could be improved by offering a few examples demonstrating the effectiveness of the model. Although the time for demonstration has been short, has the PLT conducted some action that has supported or helped sustain process continuity. Has the PLT realized some successes in providing academic support or discovered areas where it needed to make adjustments, e.g., lessons learned.

--Peer Reviewer Two: Agree with Reviewer One. Capture any "lessons learned" during this time.

--Peer Reviewer Three: given the short time elapsed since the implementation of the pathway, most "lessons learned" may be difficult to fully capture as of yet. Structure and methodology of PLT seems well thought out.

--Peer Reviewer Four: Following up with Reviewer One, a well-chosen student example, or two, pulled from recent PLT meetings could underscore either process continuity or need for adjustment.

Program Response to Review Comments
An example of the Pathway Leadership Team providing academic support to a student.

A number of students in MATH 1400 had alerts put into Navigate due to poor academic progress. The Pathway Academic Advisor was notified, through Navigate, about these alerts and the concerns from the faculty. The Pathway Academic Advisor shares these alerts with the Pathway Coordinator to get another perspective and to have more resources on how to help these students get back on track. The advisor reaches out to the students initially asking if they need any assistance and that they should correspond with their instructor(s) to see how they can improve their performance. The Pathway Coordinator also contacts these students to let them know there is a team and resources behind helping them maintain a path to success. The Pathway Coordinator also reaches out to the instructor(s) to see if there is any other information or miscommunication between them and the students that could help the student feel more confident in asking for help or communication further with the instructor.

In this particular case, several students were able to correspond with the instructor(s) and devise a plan to get back on track in the class. Previously, these students may have just faded away and not have been heard from again until they took the class over or just completely dropped out of school.

This holistic and intrusive type of advising and mentorship is proving to be successful in helping students stay persistent. It has not worked in every case, by far, but some of the initial results are positive.

8. Identifying and sharing best practices of Pathway program performance

In past years, Institutional Effectiveness staff have compiled a listing of best practices based on peer-review feedback comments in the self-study. This year five best practices were identified among the fifty-eight self-study sections. Most emerged from section V. Ensure That Students Are Learning. The Institutional Effectiveness virtual site will display the STEM best practices, so they can be shared among faculty, especially those who will be preparing Pathway Review self-studies in future cycles. This listing will grow at the completion of each Pathway Review cycle. The self-study sections identified as best practices are listed below and their full display is located in Appendix B.

IV.A.4: Relevancy of the Program's Curriculum
V.A.3: **Best Practices in Instruction**
V.C.4: **Annual Program Assessment Plans for Operational Outcomes**
V.D.1: **Story-Line Narrative of Pathway Performance**
VI.A: **SWOT Analysis**

9. Developing review findings into a SWOT analyses that affects action plan goal development

For the 2020-2021 Pathway Review, the Pathway Coordinator and program faculty leads were to conduct a strengths, weaknesses, opportunities, and threats (SWOT) analysis for each of the four pillars: Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, and Ensure That Students Are Learning. Therefore, most SWOT items list multiple pillars to describe the breadth of reach for each of the items. The Pathway Review SWOT section serves as a "summary piece" of the review process that responds to the question: What was learned from completing the Pathway Review process?

The SWOT also serves as a central resource for the Pathway to form its action plan goals for the future: whether the Pathway wants to leverage their strengths with added resources, respond to weakness with interventions, take advantage of opportunities, or prepare for threats. STEM developed and action plan goal for each of the four Pathway pillars. This is a distinctive characteristic of the Pathway Review over the previous program review format as these action plans are to focus on improving performance specific to the pillar intent. This focus reduces the distraction of human effort to other pursuits. The Pathway did an excellent job of aligning its four action plan goals with SWOT items. STEM has aligned planning with the three categories of Strengths, Weaknesses, and Opportunities. The alignments are color-coded to demonstrate the match between a goal and its corresponding SWOT item. To view the complete description of STEM's four action plan goals including strategies and timelines, see the STEM Pathway Review Self-Study in Appendix A, Section N.

Goal One (Help Students Choose and Enter a Pathway)
Promote the STEM Pathway as an opportunity for students interested in any field involving the sciences, computer technology, engineering, and math.

Goal Two (Help Students Stay on Their Path)
Bolster persistence within the STEM Pathway by focusing efforts to assist students in the completion of a college-level Math during their first, no later than second, semester at LCCC. Increase success rates for college-level Math by 15%-20%.

Goal Three (Clarify Paths to Student End Goals)
The STEM Pathway, as a collective program, shall increase graduation rates by 20%.

Goal Four (Ensure That Students Are Learning)
The STEM Pathway and programs within it ensure that pathway, program, and course-level competencies are in alignment. Student learning begins with consistency across the program(s) and a process to where measurable, common data can be analyzed to truly assess how students in the Pathway are learning and where there may be gaps in assessing the competencies.

VI.A: SWOT Analysis Program

Self-Study Narrative

Below is a list of Strengths, Weaknesses, Opportunities, and Threats which are relevant to the STEM Pathway Program as well as all specific programs in the Pathway.

Strengths:

- Individual student course success - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Collaborative, world-class faculty - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Community engagement - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path*
- Technology and equipment for individual classrooms - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Ensure That Students Are Learning*
- Grant Attainment - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Service to other pathways through curriculum - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Transparent and realistic math attainment goals for all students - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- PLT implementation - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Active Learning approaches - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Guided flexible programming - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*

Weaknesses:

- Degree Completion - *Help Students Stay on Their Path, Clarify Paths to Student End*
- Transfer Rates - *Clarify Paths to Student End Goals*
- Student Learning Assessment - *Ensure That Students Are Learning*
- Physical Campus Locations and Space restrictions - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Internal infrastructure (Need more electricity) - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- English Completion in a students first year - *Help Students Stay on Their Path, Ensure That Students Are Learning*
- Identification of Gateway courses and Milestones outside of Math and English completion in a student's first year - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Clear identification of the role of advisory committee - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*

Opportunities:

- High pay for graduates of STEM - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- STEM is a community buzz word - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Business and industry collaboration within the community - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*

- Expansion of undergraduate research - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Increased contextualization of STEM STRT - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Increased access to quality OER resources for faculty and students - *Help Students Stay on Their Path, Ensure That Students Are Learning*

Threats:

- Continued Enrollment problems post Pandemic - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Funding for technology relevance - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Loss of faculty due to other competitive opportunities - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Low enrollment due to increased entry-level job availability and pay structure - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*

10. Regeneration of the Pathway Review: Developing faculty-informed improvements to the review process

Each May, the chair of the Academic Standards Committee (ASC) Program Review Subcommittee Dr. Erin Nitschke regularly administers a Pathway Review survey for faculty and peer-reviewers to acquire feedback that informs improvement of the Pathway self-study template and review processes. On May 3, 2021, a Zoom-distributed survey (8:00 a.m. and 3:00 p.m.) produced extensive feedback. The faculty feedback items were included in a September 3 memorandum to the Academic Standards Committee. To view this memorandum, see Appendix D.

As a follow-up action to implement faculty feedback, Dr. Nitschke worked to assemble a faculty group (Ami Wangeline, Suzie Lemaster, Melanie Young, Dean Bryon Wilson, with assistance of the AVPIE and Director of IR) to meet over the summer. The group made numerous revisions to the Pathway Review self-study template. The Trades and Technical Studies Pathway is using this revised Pathway Review template to develop its self-study during this fall and January 2022.

11. Program follow-up reporting and action planning intended for strengthening areas identified for added attention

To be consistent with its continuous improvement processes, LCCC includes follow-up action planning in its academic program review activities. During the peer-review process, programs perform well on the majority of self-study sections, but occasionally a few sections need additional attention. For these situations, the program review process includes a structured follow-up planning phase to support program strengthening of these areas in the form or additional action plans if current plans do not address low performing areas. In September 2021, the Academic Standards Committee approved the recommendations of its Program Review Subcommittee to accept all six STEM Pathway Review programs without contingencies, meaning no follow-up planning was recommended. To view the Academic Standards Committee memorandum containing these recommendations, see Appendix D.

CONCLUSION: WHAT HAVE WE LEARNED FROM THE FIRST PATHWAY REVIEW

Not all Pathways are created equal

Whereas the STEM Pathway programs are highly integrated, the Trades and Technical Pathway will likely produce a self-study where more content is program specific. For example, the STEM set four action plan goals with strategies that involve all six programs together. Each of STEM's six programs did not generate their own distinct action plan goals. However, other pathways may want to establish action goals distinct to specific programs as their structure varies from that of STEM's. This may be the case for the Trades and Technical Studies Pathway (TTS) currently completing a self-study for 2021-2022. Another example of STEM's collaborative Pathway structure is that a common semester course assessment does not involve a single program's students but multiple programs' students. However, TTS Pathway programs focus early on credit diploma completions and as such, programs like welding will contain mostly welding students (a few non-welding majors do take welding courses).

Relationship building is a new skill

Still, it is unremarkable that the STEM Pathway Review should demonstrate more centralized and collaborative narratives because this is how Pathway programs are supposed to perform. The clear distinctions among program performances as demonstrated in past program reviews is fading. This was evident with the sometimes shallow description of relationship-making from Pathway narratives and the frustrations expressed among peer-reviewers who hoped to see professional development experiences, course activity, and action planning that was highly discipline specific. The more mature Pathways better support a healthy education ecology whereby program faculty learn to develop collaborative behaviors and identify characteristics of successful relationship development, while peer-reviews learn to value the making and operation of these relationships. The College's Pathway Review standards present expectations for effective relationship building, e.g., Pathway Leadership Teams working with advisory committees. It will be exciting to learn over time if Pathways will lead to ecological balance points where all stakeholders win. With the STEM review, we made a good start at getting good at this. Through a collaborative Pathway Review process, we might learn how to do this better, and those lagging student outcomes will strengthen.

A new way of thinking

This could be a good opportunity for the College to examine the Board of Trustees Policy 10.2 and its four program review objectives. Added emphasis could be placed on the value of collaboration and relationship building to help guide what is meant by improvement and if there is a dimension beyond the program level to be addressed. As for the program review procedure 10.2P, Could a component of student services be brought into program review to make the claim of "helping students stay on a path" more meaningful and complete? Sustain an emphasis on competition, which is healthy also, but put it to work among the individual Pathways rather than among the programs within a Pathway.

This would not leave programs off the hook. It challenges them to demonstrate and provide evidence of how they contribute to the Pathway as a whole with distinct contributions that make collaboration and relationship building robust within the Pathway to the extent that more students succeed and workplaces are better served (e.g., show what the relationships produce). In addition, the College's new *2030 Strategic Plan* presents an initiative to develop an annual program analysis process (goal three) that uses traditional student outcomes data such as participation, success rates and completion rates along with workplace demand indicators such as job listings, regional wages, placement and transfer rates. The development of this annual program analysis could add indicators supporting relationship building, e.g., program use of Canvas discussion areas, annual number of agenda-producing meetings with stakeholder groups (e.g., network density), student surveys on the diversity, number and effectiveness of formal discipline-based group relationships. The scatter plot display of the analysis

could be brought into the Pathway Review template for dialogue development among self-study authors and peer review faculty/staff.

Face-to-Face meetings need to be scheduled sooner

From the May 2021 faculty feedback event, we learned that the face-to-face meetings among self-study authors and peer-reviewers, usually scheduled for April, need to be scheduled earlier (January/February) so that the faculty developing the self-study can explain to the peer-reviewers the factors that are unique to their Pathway operation. This ensures better understanding among reviewers of the Pathway's content development strategy and its operational behavior before peer-reviewers rate the self-study sections.

The ASC Program Review Subcommittee is expanding its role in the Pathway Review Process

We learned that the Academic Standards Committee (ASC) Program Review Subcommittee desires to play a larger role in obtaining annual faculty feedback for improving the Pathway Review process and for participating in the faculty-involved work of revising the Pathway self-study template for continuous improvement of the process. Opportunities are being provided for this role expansion to occur.

Should improve how we articulate the collaborative essence of Pathway Reviews

We learned that the orientation for Pathway peer-reviewers needs to include a section explaining how Pathway Reviews differ from our previous, more conventional program review process. Several reviewers expressed their frustration with reviewing programs that largely adopted a collective, collaborative approach to narrative development when expectations were for a more program specific treatment.

The STEM Pathway Review indicates that LCCC is achieving success in implementing Guided Pathways 2.0

Ideally, the College uses program review to accelerate its transition to becoming an effective Guided Pathways 2.0 institution. This Annual Report to the LCCC Board of Trustees indicates that a significant first step was taken to initiate an institutional Pathway program evaluation process. The current schedule for Pathway Review is displayed below in Table 5.

Table 5 Pathway Review Schedule, 2020-21 to 2024-25

2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
STEM	Trades & Technical Studies	6 programs HSW^ & Business & Accounting & IT Pathway	Human & Public Services & Communication & Creative Arts	5 programs HSW^ & Agriculture & Equine
1. STEM (AS)				
2. Biology (AS)				
3. Biomedical Sciences (AS)				
4. Computer Science (AS)				
5. Engineering (AS)				
6. Physical Science (AS)				

Annual Report to the LCCC Board of Trustees

Appendices

Appendix A:

Summary of the STEM Pathway Review Self-Study, 2020-2021

School of Math and Sciences	
Pathway	Science, Technology, Engineering, and Mathematics (STEM) Pathway
Pathway Programs	Biology (AS), Biomedical Sciences (AS), Computer Science (AS), Engineering (AS), Physical Science (AS), STEM (AS)
Review Period	2015 to 2020
Self-Study Developed	AY 2020-2021
Review Status	Academic Standards Accepted Pathway Review of all six STEM Programs
STEM Pathway Coordinator	Trent Morrell
Committee Chair	Erin Nitschke
Academic Standards Program Review Subcommittee Reviewers	Kristin Abraham: Faculty, English Kim Bender: AVP, Institutional Effectiveness Andrea Clubb: Coordinator, Disability Services Sheridan Hanson: Pathway Coordinator, Health Sciences & Wellness Kari Brown-Herbst: VP of Academic Affairs Damien Kortum: Interim Dean, Arts & Humanities Starla Mason: Dean, Health Sciences and Wellness Erin Nitschke: Faculty, Exercise Science & Chair ASC APR Subcommittee Caleb Perriton: Pathway Coordinator, Trades and Technical Studies DeWayne Saulsberry: Head Coach, Men's Basketball Maggy Swanger: Librarian Lisa Taylor: Faculty, Psychology Marie Yearling: Faculty, Microbiology & Chair of ASC SLA Subcommittee

Introduction

This summary of the STEM Pathway Review integrates the highlights expressed in the review's self-study, which was developed from October 2020 until early February 2021. It includes content related to the STEM Pathway's six programs: Biology (AS), Biomedical Sciences (AS), Computer Science (AS), Engineering (AS), Physical Science (AS), and STEM (AS). The Pathway Review Self-Study was peer-reviewed by the ASC Program Review Subcommittee during spring 2021. The Academic Standards Committee voted in early October 2021 to accept the Subcommittee recommendation, which was to approve all six program reviews with no contingencies.

This summary consists self-study narratives and data tables drawn directly from the self-study. The sections are ordered, more or less, in the order that they appear in the self-study template. The summary begins with presentation of the Pathway self-study template so that the reader obtains an impression of how the whole review is structured around the Pathway pillars and can realize the order of topics and standards. It includes program summaries and achievements, data descriptions using the Voluntary Framework of Accountability (VFA) format, and descriptions of student learning assessment planning. The summary ends with the action plan

goals installed for future improvement of the STEM Pathway and a SWOT summary resulting from what was learned by experiencing the Pathway review process.

This summary does not include information related to the program review process, such as the surveying of faculty for improvement on the process in May 2021 or the summer 2021 work faculty completed to revise the Pathway Review Self-Study template based on faculty feedback provided by the survey administration.

A. Pathway Review Self-Study Template for 2020-2021 Cycle

I. General Pathway Overview

A. Introduction of the Pathway

I.A.1 - Overarching Context of the Pathway
I.A.2 - Pathway Program

B. Pathway Organizational Structure

I.B.1 - Organizational Structure: Functional Continuity and Communication

C. LCCC's Mission, Vision, Values

I.C.1 - Mission Statement
I.C.2 - Core and Aspirational Value Statements

D. Student Demographics

I.D.1 - Student-Related Data

E. Job and Transfer Opportunities and Managing Pathway Responsiveness

I.E.1 - Job and Transfer Opportunities
I.E.2 - Programmatic Responsiveness

II. Help Students Choose and Enter a Pathway

Redesign traditional developmental education as an "on-ramp" to a program of study, which helps students explore academic and career options from the beginning of their college experience, aligns math and other foundation skills coursework with a student's program of study, and integrates and contextualizes instruction to build academic and nonacademic foundation skills throughout the college-level curriculum, particularly in program "gateway" courses. Provide accelerated developmental education to help poorly prepared students succeed in college-level courses as soon as possible.

A. Community Outreach and Engagement

II.A.1 - Relationship Building
II.A.2 - Engaging Student Services Staff

B. Pathway Exploration

II.B.1.i - Academic Exploration
II.B.1.ii - Academic Exploration: STRT 1000 Courses

C. Gateway Courses

II.C.1 - Impact of Gateway Courses on Student Matriculation

D. Discoveries and Action Items for Help Students Choose and Enter a Pathway

II.D.1 - Story-Line Narrative of Pathway Performance

II.D.2 - Recommendations for Improvement and Developing Action Plans

III. Help Students Stay on Their Path

Support students through a strong advising process embedded and ongoing in the Pathway experience and supported by appropriate technology to help students make informed choices, strengthen clarity about transfer and career opportunities at the end of their chosen college path, ensure they develop an academic plan with predictable schedules, monitor their progress, and intervene when they go off track. Embed academic and non-academic supports throughout students' programs to promote student learning and persistence.

A. Embedded and Ongoing Advising

III.A.1 - Engaging Advisors

B. Predictable Schedules

III.B.1 - Scheduling Course Offerings

C. Monitor Student Progress

III.C.1 - Student Adherence to Choice Points

III.C.2 - Milestones

D. Persistence Supports

III.D.1.i - Academic Supports

III.D.1.ii - Non-Academic Supports

III.D.2 - Developing Communities of Interest

E. Discoveries and Action Items for Help Students Stay on Their Path

III.E.1 - Story-Line Narrative of Pathway Performance

III.E.2 - Recommendations for Improvement and Developing Action Plans

Specific or Discrete Program Area

IV. Clarify Paths to Student End Goals

Simplify students' choices with default program maps developed by faculty and advisors that show students a clear pathway to completion, further education and employment in fields of importance to the region. Establish transfer pathways through alignment of Pathway courses and expected learning outcomes with transfer institutions, to optimize applicability of community college credits to university majors.

A. Program Description

IV.A.1 - Broad Summary

IV.A.2 - Achievements

IV.A.3 - Program Design

IV.A.4 - Relevancy of the Program's Curriculum

B. Career Alignment Relationships and Student Outcomes

IV.B.1.i - A.A. and A.S. Transfer Programs
IV.B.1.ii - A.A. and A.S. Transfer Programs
IV.B.2.i - A.A.S., Certificate, and Credit Diploma Programs
IV.B.2.ii - A.A.S., Certificate, and Credit Diploma Programs

C. Discoveries and Action Items for Clarify Paths to Student End Goals

IV.C.1 - Story-Line Narrative of Pathway Performance
IV.C.2 - Recommendations for Improvement and Developing Action Plan(s)

V. Ensure That Students Are Learning

Establish program-level learning competencies aligned with the requirements for success in employment and further education in a given field and apply the results of learning competencies assessment to improve the effectiveness of instruction across programs. Integrate group projects, internships, and other applied learning experiences to enhance instruction and student success in courses across programs of study. Ensure incorporation of effective teaching practice throughout the Pathways.

A. People of the Program

V.A.1 - Faculty-to-Student Relationships
V.A.2 - Professional Development
V.A.3 - Best Practices in Instruction
V.A.4.i - Effective Educational Practices: Instructional Methods
V.A.4.ii - Effective Educational Practices: Resources for Teaching

B. Program-Level Learning Competencies

V.B.1 - Program-Level Learning Competencies

C. Verifying Student Learning

V.C.1 - Curriculum Map
V.C.2 - Student Learning Feedback System
V.C.3 - Annual Program Assessment Plans for Student Learning Competencies
V.C.4 - Annual Program Assessment Plans for Operational Outcomes
V.C.5 - Student Learning Data Items That Reveal Student Academic Success

D. Discoveries and Action Items for Ensure Students Are Learning

V.D.1 - Story-Line Narrative of Pathway Performance
V.D.2 - Recommendations for Improvement and Developing Action Plans

VI. Conclusion

A. SWOT Analysis

VI.A - SWOT Analysis

B. Overarching Context of the Pathway

The Pathways 2.0 Program was created in 2015 by the American Association of Community Colleges (AACC). The purpose of this initiative is to intentionally design clear and coherent structure to educational experiences, informed by evidence, that guide each student effectively and efficiently from his/her point of entry through to attainment of high-quality postsecondary credentials and careers with value in the labor market (AACC 2020).

The Science, Technology, Engineering, and Mathematics (STEM) Pathway is designed to allow any student interested in STEM career fields to begin their academic journey in a common schedule of courses during their first semester. This first semester serves as a "jumping off" point into a specific degree program or other tailored degree within the STEM Program (see STEM Program Map).

For instance, students in the STEM Pathway interested in transferring to obtain a mathematics degree would work with the advisor and Pathway Coordinator to devise a program map that defines choice points and a sequence of mathematics courses along with other STEM courses tailored to the students' interests. Once the student has completed the STEM degree with their uniquely tailored sequence of courses, the student should be able to transfer to a university and continue on for completion of a math degree.

*See below for an example of how a mathematics "focus" can be obtained by a student declaring the STEM Program degree. The plan throughout the next review cycle is to have other plans within the STEM A.S. which will have articulation agreements with University of Wyoming and other 4 yr. institutions.

STEM (Mathematics)

ASSOCIATE OF SCIENCE DEGREE (63-70 CREDITS IN LENGTH)

Description:
Knowledge of mathematics is essential for a successful career in nearly all fields, particularly those in the STEM disciplines, as well as an appreciation of our surroundings. The mathematics courses offered meet the needs of students in every Pathway of the college. Students who complete an Associate of Science degree in STEM with a focus in mathematics will demonstrate knowledge and skills necessary for mathematics majors and will be prepared to transfer to a four-year institution.

Program Competencies

Upon successful completion of this program, students will be able to:

1. Demonstrate basic procedural fluency in trigonometry, calculus, matrix algebra and differential equations.
2. Communicate mathematical thoughts and ideas clearly and concisely to others in both oral and written form.
3. Use appropriate technology to enhance mathematical thinking and understanding, to solve mathematical problems, and to evaluate the reasonableness of results.
4. Analyze and construct mathematical arguments.
5. Demonstrate an ability to transfer mathematical skills/techniques from one situation to another to show an ability to solve diverse problems.

Degree Requirements:

Year One - 1st semester

STRT 1000 Strategies for Success	3.0
ENGL 1010 English Composition I	3.0
MATH 2200 Calculus I	4.0
Approved U.S./Wyoming Constitution Course	3.0
Approved Cultural Awareness Course	3.0
	16.0

Year One - 2nd semester

COSC 1010 Introduction to Computer Science	4.0
COMM 2010 Public Speaking	3.0
PHYS 1310 College Physics I	4.0
MATH 2205 Calculus II	4.0
	15.0

Year Two - 1st semester

MATH 2210 Calculus III	4.0
MATH 2250 Elementary Linear Algebra	3.0
CHEM 1000 Intro to Chemistry	4.0
OR	
CHEM 1020 General Chemistry I	
OR	
GEOL 1100 Physical Geology	
OR	
BIOL 1010 General Biology	4.0
OR	
PHYS 1320 College Physics II	
OR	
COSC 1030 Computer Science I	
Approved Elective Course	1.0 - 4.0
	15.0 - 19.0

Year Two - 2nd semester

MATH 2310 Applied Differential Equations	3.0
MATH 2800 Mathematics Major Seminar	2.0
STAT 2010 Statistical Concepts--Business	4.0
OR	
STAT 2050 Fundamentals of Statistics	4.0
OR	
STAT 2070 Introductory Statistics for Social Sciences	
Approved Aesthetic Analysis Course	3.0
Approved Elective Course	1.0 - 4.0
	17.0 - 20.0
Total:	**63.0 - 70.0**

C. Program Specific Summaries

STEM
The STEM program is designed for students who wish to explore a wide range of career options in science, technology, engineering, or mathematics in anticipation of selecting a degree in one of these specific fields.

After the first semester of this program, students will either branch off into a specific STEM program or work closely with their advising team to select appropriate courses. Students will have the opportunity to accomplish their individual career/academic goals and interests and ensure their credits/time to graduation are minimized. This degree offers necessary course work to transfer to a four-year university, allowing students to pursue a general baccalaureate degree or further education in STEM. Many careers in STEM will require advanced degrees.

Biology
The Biology program at LCCC prepares students for careers in the dynamic and rapidly changing fields of life science. This program covers a wide spectrum of disciplines from wildlife and conservation to molecular biology and human medicine. Recent advancements in molecular, cellular and computational biology have led to expanded employment opportunities for biological and life scientists. Students planning careers in biology, biochemistry, botany, conservation, ecology, forestry, medicine, microbiology, wildlife or zoology should complete this curriculum. The successful completion of this program leads to an Associate of Science degree with anticipated transfer to a four-year program. Through the Biology program, students will explore a range of biological science fields and can participate in authentic scientific research. Due to the diversity of opportunities, we encourage students to contact Biology program faculty for more information about how this program aligns with student's career goals.

Biomedical Sciences
The Biomedical Sciences degree at LCCC is designed for students who wish to improve the lives and health of their community by serving as a doctor of medicine, veterinary, pharmacy or dentistry. Students who complete this program achieve an Associate of Science degree with the necessary course work to apply to a four-year university or medical-related professional school. Each university and professional school have specific course requirements; consultations with LCCC's network of advisors and faculty mentors is highly recommended to plan coursework that meets the requirements of the student's transfer school of choice. Students in the Biomedical Science program have the opportunity to explore a range of medical professional fields and can participate in disease-centered biomedical research on our campus.

Computer Science
There are more software jobs than can be filled with current graduates, with this remaining true for the foreseeable future. These are high-paying jobs housed in rich working environments. Software-related work is a highly creative endeavor and interesting design problems arise in every project. The creative aspect of the work is stimulating and can sustain an entire career. Traditional areas of computer science such as graphics, software engineering, networks, databases, multimedia, and artificial intelligence remain strong, with job growth being driven by advances in robotics and the fundamental impact of computer science in nearly every industry. There are many challenging problems remaining for computer scientists to solve.

The Computer Science program offers an Associates of Science transfer degree. It has been articulated with the University of Wyoming's Computer Science bachelor's degree with a 2+2 plan. It can be adapted to transfer to other 4-year programs in the many specialized concentrations in the broad category of Computer Science.

Engineering

The Engineering program at LCCC is a program within the School of Math and Sciences. The program offers an Associate of Science in Engineering in alignment with the STEM Pathway. It is designed to prepare students for transfer to a four-year degree in many sub-fields of engineering (civil, mechanical, electrical, and others). The program works closely with the Associate Dean for Academic Programs at the University's College of Engineering and Applied Science and departmental faculty to promote the LCCC program to the University's students.

Due to declining enrollment at the main campus and in collaboration with the University of Wyoming's College of Engineering and Applied Science, the Engineering program was moved to the Albany County campus of LCCC in Fall 2014. By 2016 the number of students in engineering science classes ranged between 10 and 20 students. Since then, enrollments have declined slightly, and the sole Engineering faculty resigned in the summer of 2020. In effort to grow the engineering program, College leadership has chosen to move the program completely online beginning Fall 2021. This development will encourage enrollments beyond the local community and provide access to students whose schedules may not allow participation in location and time-bound courses. To ensure student success, the ACC will provide a cohort model with supplemental instructors assigned to challenging courses. A search is occurring during the Spring 2021 semester to hire an ACC faculty to instruct all engineering science program courses.

Additionally, ACC leadership is collaborating with the University of Wyoming to create a block articulation, ensuring students who complete the Associate of Science in Engineering Science at LCCC will be able to complete a Bachelor's of Science in the following engineering disciplines: Chemical Engineering, Civil Engineering, Energy Systems, and Petroleum Engineering. This block articulation will require the ACC to make minor program modifications, which will be submitted to LCCC's Academic Standards Committee for review in the Fall of 21. The Engineering program offers seven Engineering Science courses, all of which transfer to the University of Wyoming. These are:

ES 1060 - Introduction to Engineering Computing
ES 2110 - Statics
ES 2120 - Dynamics
ES 2210 - Electric Circuit Analysis
ES 2310 - Thermodynamics
ES 2330 - Fluid Dynamics
ES 2410 - Mechanics of Materials

As the program will be offered completely online, there is very little cost associated with the program other than the salary of the full-time faculty, supplemental instruction, and potential virtual laboratory services.

Physical Sciences

The Physical Science program at LCCC prepares students for transfer to nearby institutions by providing them with foundational coursework necessary to succeed in those programs. Physical Science broadly covers topics in chemistry, earth science, and physics. Students interested in careers in astronomy, chemistry, environmental

science, geology, physics and the like should consider completing this curriculum. The successful completion of this program provides the student with foundational courses in these areas that leads to an Associate of Science degree with anticipated transfer to complete their bachelor's degree in 2.5-3 years.

D. Program Achievements Over the Review Period

STEM Pathway Program

The STEM Program is new as of fall 2020 and therefore cannot list measurable and demonstrated achievements over the past five years that relate to the Pathway's values and priorities. The STEM Program promotes personal and professional growth through the development of scientific reasoning across all the STEM disciplines. The goal of the program is to prepare students for a wide variety of career fields within STEM.

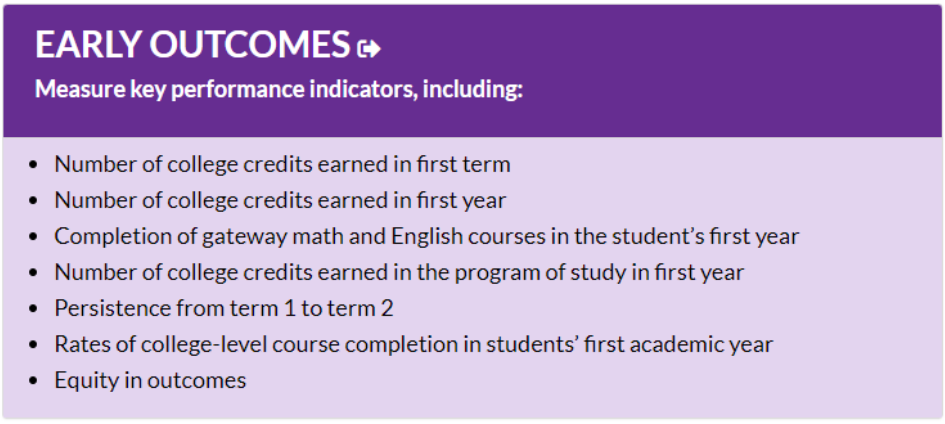
A career in STEM often means being at the front of ground-breaking technology and research. This rapidly growing field encompasses computer programming and the latest technology, medicine and scientific research, a variety of engineering fields (mechanical, chemical, civil, more), and analysis or statistics.

The Pathway Program is designed for students who wish to explore a wide range of career options in science, technology, engineering, or mathematics in anticipation of selecting a degree in one of these specific fields. After the first semester of this program, students will either branch off into a specific STEM program or work closely with their advising team to select appropriate electives.

STEM Program Competencies:

- Solve problems in the fields of STEM
- Follow ethical standards in STEM
- Effectively communicate in the STEM fields
- Examine STEM fields in historical and contemporary contexts

The plan for the next review cycle is to look at data showing number of completions, transfers, and job or internship placement. Using these metrics, the STEM Program will have measurable data from which it can demonstrate levels of achievement. It is estimated, based on the Pathways 2.0 Initiative Early Outcomes, that student success in the form of some sort of completion, will be increased significantly compared to previous rates within STEM majors prior to Pathways implementation. The Key Performance Indicators (KPIs) listed as part of these early outcomes will provide the list of measurable achievements. The timeline for demonstrating this success will be the full, 5 yr. review cycle.



Six Pathway Programs Collectively

Awards:

- 2021 Faculty of the Month, Faculty Senate, LCCC (MY)
- 2020 Teaching Excellence Award, Student Government Association, LCCC (ZR)
- 2020 Nominated for the Teaching Excellence Award, Student Government Association, LCCC (JS)
- 2020 Jean Theodore Lacordaire Prize for Best Published Paper based upon a Doctoral Dissertation, Coleopterists Society of America (GM)
- 2019 Wyoming Innovative Faculty of the year (MY)
- 2019 Nominated for the Teaching Excellence Award, Student Government Association, LCCC (JS)
- 2019 Five Star Faculty Award, Phi Theta Kappa Honor Society, LCCC (AW)
- 2019 Extra Mile Award, Disability Support Services, LCCC (AW)
- 2018 Teaching Excellence Award, Student Government Association, LCCC (ZR)
- 2018 Nominated for the Teaching Excellence Award, Student Government Association, LCCC (JS)
- 2018 Nominated for the Dale P. Parnell Distinguished Faculty, American Association of Community Colleges, Washington, DC. (ZR)
- 2018 Above and Beyond Award, President's Cabinet, LCCC (ZR)
- 2017 Nominated for the Teaching Excellence Award, Student Government Association, LCCC (ZR)

Community Events:

- STEM Day hosting high school students at LCCC (2019, 2018, 2017)
- Bioblitz community event (2015, 2016, 2017, 2018)
- Participation in LCCC 50th anniversary celebration with science stations (2018)
- LCSD Science fair judges (2019)
- Wyoming FFA ENR Contest (2006 – present)
- Outreach to local elementary schools (annually)

Grants Funded:

- 2016.Expanded access to electron microscopy techniques and use by undergraduate students. Wyoming INBRE Scaled Participatory Research and Education Model (SPREM), Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $27,625.00
- 2016.Laramie County Community College, Wyoming IDeA Networks for Biomedical Research Excellence (INBRE 3). U.S. Department of Health and Human Services, National Institutes of Health. $40,000.00
- 2016. Expansion of molecular biology research opportunity for LCCC students. Wyoming INBRE Scaled Participatory Research and Education Model (SPREM), Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $15,000.00
- 2017. The influence of gut microbiome on Toxoplasmosis infection and a CURE for students' experimental design abilities. Wyoming INBRE Collaborative Research Projects, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $18,127
- 2017. Promoting Active Learning and Mentoring Network (PALM) American Society of Cell Biology grant for course development. $3,000
- 2017. Purchase of a Confocal Fluorescence Microscope. Department of Education – Perkins Equipment grant. $119,479

- 2017. Purchase of a RT PCR system. Department of Education – Perkins Equipment grant. $36,571
- 2017.Laramie County Community College, Wyoming IDeA Networks for Biomedical Research Excellence (INBRE 3). U.S. Department of Health and Human Services, National Institutes of Health. $40,000.00
- 2017. Are all burns created equal? The role of fire interval on community structure in the Greater Yellowstone Ecosystem. University of Wyoming-National Park Service Research Station, Small Grant Program. $5,000.00
- 2017. Bioinformatics workstation and Geneious software. Wyoming INBRE Bioinformatics Core, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $1,699.00
- 2017. Genomic assessment of the role of relatedness in spatial overlap in chipmunks. Wyoming INBRE Collaborative Research Projects, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $5,225.00
- 2017. Remodel of SC158 to accommodate small group and active learning models of teaching. Wyoming INBRE Scaled Participatory Research and Education Model (SPREM), Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $10,000.00 (plus matching funds from college)
- 2017. RNAseq and gene model improvement of *Alternaria astragali*. University of Wyoming - Wyoming Community College Collaborative Bioinformatics Grant Program, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $34,000.00
- 2018. Wyoming NASA Education Enhancement Grant. $10,000
- 2018.Laramie County Community College, Wyoming IDeA Networks for Biomedical Research Excellence (INBRE 3). U.S. Department of Health and Human Services, National Institutes of Health. $40,000.00
- 2018. Purchase of refrigerated large volume centrifuge for expanded molecular and physiological research capability. Wyoming INBRE Scaled Participatory Research and Education Model, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $15,000.00
- 2019. Wyoming IDeA Networks for Biomedical Research Excellence (INBRE 3). U.S. Department of Health and Human Services, National Institutes of Health. $40,000.00
- 2019. Purchase of S2 Picofox Total Reflection X-ray Fluorescence Spectrometer (tXRF). Community College/ Primarily Undergraduate Institution Research Network, Supplemental Equipment Grant, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $60,000.00
- 2020. IDeA Networks for Biomedical Research Excellence (INBRE 4). U.S. Department of Health and Human Services, National Institutes of Health. $50,000.00
- 2020. Purchase of Insect Collection Cabinet. Wyoming INBRE Scaled Participatory Research and Education Model, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $7,510
- 2021. Purchase of Sterling Ultra-cold upright freezer. Community College/ Primarily Undergraduate Institution Research Network, Supplemental Equipment Grant, Wyoming IDeA Networks for Biomedical Research Excellence, University of Wyoming. $20,113

Publications and Presentations-Excerpt of Six Pages (*Undergraduate Students):

- Paiz DJ*, FG Schaffer IV*, LL Carver*, AL Wangeline, HC Lanier and ZP Roehrs (2016) Occupancy modeling to examine meso-mammal diversity and abundance at an urban-rural interface of

Cheyenne, Wyoming. 96th Annual Meeting of the American Society of Mammalogists, University of Minnesota, Minneapolis, MN.

- Powell GS and GJ Martin (2019) Type designations for sap beetles in the subfamily Carpophilinae Erichson (Coleoptera: Nitidulidae) housed in the Natural History Museum, London. Zootaxa, 4590(2): 297–300.
- Ridgway KM*, DJ Paiz*, PC Marsh*, AD Petersen, BJ Devilbiss*, AL Wangeline and ZP Roehrs (2017) Molecular identification of rhizosphere fungi isolated from a selenium rich ecosystem. Undergraduate Research Day, Laramie, WY.
- Ridgway KM*, DJ Paiz*, PC Marsh*, AD Petersen, BJ Devilbiss*, AL Wangeline and ZP Roehrs (2017) Molecular identification of rhizosphere fungi isolated from a selenium rich ecosystem. 2nd Annual Wyoming IDeA Network for Biomedical Research Excellence Conference, Laramie, WY.
- Roehrs ZP, CL Springer and AL Wangeline (2018) Early engagement of undergraduates in research, an avenue for science education reform? 98th Annual Meeting of the American Society of Mammalogists, Kansas State University, Manhattan, KS.
- Roehrs ZP, CL Springer, MN Yearling and AL Wangeline (2019) Growth, change, and collaboration: 2018–19 LCCC INBRE. 3rd Wyoming IDeA Networks for Biomedical Research Excellence Annual Spring Conference, University of Wyoming, Laramie.
- Roehrs ZP, FG Schaffer, IV,* DJ Paiz,* JM Williams,* ME Loetscher* and MA Roehrs (2016) Results of mammal surveys in the Cheyenne Business Park Natural Area (Final Report to Laramie County Conservation District) Laramie County Community College, Cheyenne, WY.
- Roehrs ZP, RA Benedict, TE Labedz, and HH Genoways (2021) Observations on the distribution and status of selected Nebraska mammals. Transactions of the Nebraska Academy of Sciences 41:1–28.
- Saxton NA*, GS Powell, GJ Martin, and SM Bybee (2020) Two new species of coastal Atyphella Olliff (Lampyridae: Luciolinae). Zootaxa, 3: 270–276.
- Saxton N*, K Johnson, A Monson, S Serrano, G Powell, G Martin, and SM Bybee (2018) Taxonomy of Atyphella aphrogeneia, a marine firefly in Melanesia. Annual meeting of the Entomological Society of America.
- Sharkey CR, MS Fujimoto, NP Lord, S Shin, DD McKenna, A Suvorov, GJ Martin, and SM Bybee (2017) Overcoming the loss of blue sensitivity through opsin duplication in the largest animal group, beetles. Scientific Reports, 7(8): 1–10.
- Sherwin M*, ME Loetscher*, GL Garcia*, ZP Roehrs, and HC Lanier (2016) Assessing the habitat preferences of shrews in the Greater Yellowstone Area: does burn history matter? Undergraduate Research Day, Laramie, WY.
- Sherwin M*, ME Loetscher*, GL Garcia*, ZP Roehrs, and HC Lanier (2016) Assessing the habitat preferences of shrews in the Greater Yellowstone Area: does burn history matter? 1st Annual Wyoming IDeA Network for Biomedical Research Excellence Conference, Laramie, WY.
- Slater TF and Uzpen B (2020) What is Learned by Undergraduates in Dispersed Remote Telescope Observing Teams: Preliminary Results. American Geophysical Union National Meeting (virtual).
- Slater TF, and Uzpen, B (2020) Preliminary Results on Students in Dispersed Remote Telescope Observing Teams. American Association of Physics Teachers, PAR-D01.
- Uzpen B, and Slater TF (2020) Photometric Determination of the Distance to the RR Lyrae LP Cam. Astronomy Theory, Observations, and Methods: 1(1): 54-60.
- Uzpen B, Houseal AK, Slater TF, & Nuhfer EB (2019) Scientific and quantitative literacy: A Comparative study between STEM and non-STEM undergraduates. European Journal of Physics 40 (3): Article 035701.

- Walker NR, MA Roehrs, F Soldevilla†, ZP Roehrs, JM Looft, and F Schultea (2021) Comparing gaze behaviors while using pattern recognition and direct myoelectric control of a prosthetic terminal device. Prosthetics and Orthotics International, In Review.
- Wangeline AL and ZP Roehrs (2016) Providing the conditions: LCCC undergraduate research program Laramie County Community College, primary undergraduate institution program report. 1st Annual Wyoming IDeA Network for Biomedical Research Excellence Conference, Laramie, WY.
- Wangeline AL and ZP Roehrs (2017) PUI… Fertilizer for undergraduate minds and growth at Laramie County Community College Community College Program Report. 2nd Annual Wyoming IDeA Network for Biomedical Research Excellence Conference, Laramie, WY.
- Wangeline AL, GJ Martin and ZP Roehrs (2020) LCCC INBRE undergraduate research project update Wyoming INBRE Fall Retreat (virtual).
- Wangeline AL, and ZP Roehrs (2019) Learning through research: the undergraduate research experience in a community college American Association of Community Colleges and National Science Foundation, Community College Undergraduate Research Experience Summit, Washington, DC.
- Watson RM, Nuhfer E, Nicholas-Moon K, Fleisher S, Walter P, Wirth K, Cogan C, Wangeline A, Gaze E (2019) Paired Measures of Competence and Confidence Illuminate Impacts of Privilege on College Students. Numeracy 12(2): Article 2.
- Whitlock JA, Trujillo KC, and Hanik GM (2018) Assemblage-level structure in Morrison Formation dinosaurs, Western Interior, USA. Geology of the Intermountain West 5: 9–22.
- Williams JM*, ME Loetscher*, MA Roehrs and ZP Roehrs (2016) Small mammal survey of the Cheyenne Business Park Natural Area, Cheyenne, Wyoming. Wyoming INBRE Fall Retreat, Jackson Lake, WY.

E. Pathway Program: Each of the Pathways has an effective Pathway Program for supporting the pathway and its specific programs.

The Pathway Leadership Team (PLT) is a formal, team-based configuration for the coordination of student-focused activities, conversations, and actions that require the active involvement of individuals with unique perspectives and roles within an individual Pathway. The primary purpose of the STEM PLT is to monitor and ensure student involvement in, and progress through, the Pathway leading to completion of a degree or credential at LCCC. Other responsibilities include coordinating community-building activities, successful recruitment and onboarding of students into a Pathway, and general management of issues with the successful operation of the Pathway components. This requires frequent, planned interaction between the team of individuals to include the Pathway Coordinator, Pathway Advisor, and School Dean/AVP of the ACC. Pathway Leadership Team activities are coordinated by the Pathway Coordinator, and teams will meet at least bi-monthly.

- Coordinate and facilitate meetings and work of the specific Pathway Leadership Team (Dean, Pathway Coordinator, Pathway Advisor(s))
- Sustain process continuity with PLT (e.g., conducting enrollment management, curriculum management, resource development, program-level assessment)
- Develop effective communication throughout Pathway with PLT

An example of the PLT providing academic support to a student:

A number of students in MATH 1400 had alerts put into Navigate due to poor academic progress. The Pathway Academic Advisor was notified, through Navigate, about these alerts and the concerns from the faculty. The Pathway Academic Advisor shares these alerts with the Pathway Coordinator to get another perspective and to have more resources on how to help these students get back on track. The advisor reaches out to the students initially asking if they need any assistance and that they should correspond with their instructor(s) to see how they can improve their performance. The Pathway Coordinator also contacts these students to let them know there is a team and resources behind helping them maintain a path to success. The Pathway Coordinator also reaches out to the instructor(s) to see if there is any other information or miscommunication between them and the students that could help the student feel more confident in asking for help or communication further with the instructor.

In this particular case, several students were able to correspond with the instructor(s) and devise a plan to get back on track in the class. Previously, these students may have just faded away and not have been heard from again until they took the class over or just completely dropped out of school.

This holistic and intrusive type of advising and mentorship is proving to be successful in helping students stay persistent. It has not worked in every case, by far, but some of the initial results are positive.

F. Mission Alignment and Program Values

Mission Statement:

The STEM Pathway promotes personal and professional growth through the development of scientific reasoning and problem solving. The Pathway aims to inspire learning through relevant experiences that emphasize ethical and rational thought. All students in this Pathway will acquire knowledge and skills necessary to develop as professionals in a STEM field and become informed, critically thinking and engaged citizens. Within their chosen programs, students acquire the specific knowledge and skills necessary to be successful professionals within their discipline and either move on to a four-year institution and gain a baccalaureate degree or gain employment in related fields.

Program Values

An important aspect of the STEM Pathway's core and aspirational values is to provide courses that serve the STEM needs of students and their ultimate success in other LCCC Pathways (e.g., Agriculture & Equine, Business & Accounting, Communication & Creative Arts, Health Sciences & Wellness, Human & Public Services, and Trades & Technical Studies).

It is also part of the STEM Pathway's values to be a conduit to the community for STEM issues, skills and knowledge. This is done through various community outreach, collaborations and partnerships (e.g., our collaborations with Cheyenne and Laramie County GIS Coop, LCCC BioBlitz, Laramie County Conservation District, Laramie County K-12 Schools, Wyoming FFA and others). Most importantly it is through building as sense of trust and presences in the community so that they see the STEM Pathway at LCCC as an important resource within the community.

G. Program Competencies and Outcomes

STEM Degree (AS)
Upon successful completion of this program, students will be able to:

Solve problems in the fields of STEM.
Follow ethical standards in STEM.
Effectively communicate in the STEM fields.
Examine STEM fields in historical and contemporary contexts.

Biology (AS)
Upon successful completion of this program, students will be able to:

Apply scientific principles to solve problems.
Evaluate primary scientific or technical literature.
Examine the role science plays in historical or contemporary issues.
Communicate scientific information.
Explain ethical scientific behavior.

Biomedical Sciences (AS)
Upon successful completion of this program, students will be able to:

Apply scientific principles to solve problems.
Communicate scientific information.
Explain ethical scientific behavior.
Evaluate primary scientific or technical literature.
Examine the role science plays in historical or contemporary issues.

Computer Science (AS)
Upon successful completion of this program, students will be able to:

Design algorithms to solve a variety of problems using programming constructs and data structures.
Implement previously designed algorithms into computer code.
Test computer code for accuracy and completeness.
Document computer programs.

Engineering (AS)
Upon successful completion of this program, students will be able to:
Apply mathematical foundations to engineering science.
Describe the scientific background required for engineering science.
Solve engineering problems.
Evaluate problem solutions with experiments.
Evaluate engineering problem solutions with computer software.

Physical Science (AS)
Upon successful completion of this program, students will be able to:

Apply scientific principles to solve problems.
Evaluate primary scientific or technical literature.
Examine the role science plays in historical or contemporary contexts.
Communicate scientific information.
Explain ethical scientific behavior.

H. Abbreviated Summary of Program Data

The below data displays are embedded into the online STEM Self-Study template in their appropriate sections for analysis and development of section content. The below selection is a subset of those existing within the self-study template. Some, especially at the program level, were not presented here as they included low student counts, which can encroach upon student privacy.

Student Demographics by Pathway: Cohort Size and Load

LCCC Pathway Review : Student Demographics by Pathway

(Embedded in template section I.D.1.b.)

The 2018 main cohort consists of all students who are entering LCCC for the first time in the 2018 fall semester (or started at LCCC in 2018 summer and continued to the fall). The 2018 pathway cohorts are subsets of the main cohort and consist of all students who declared a program in the given pathway. In 2018 fall, STEM majors made up 12 percent of the main cohort (123 students). Of these students, 74 percent (91 students) were attending college for the first time after high school. This percentage matches the rate of degree-seeking main cohort students who are entering college for the first time after high school (73 percent).

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL	VFA COHORT
2018 Pathway Cohort	58	90	72	187	250	123	109	283	740	1,023	431,957
% of Overall Main Cohort	6%	9%	7%	18%	24%	12%	11%	28%	72%	100%	100%
2018 FTIC Cohort	49	69	60	153	161	91	82	24	543	567	259,532
% of Pathway Cohort	84%	77%	83%	82%	64%	74%	75%	8%	73%	55%	60%

Of the 123 students in the STEM pathway cohort, 77 percent (95 students) attended full-time in the fall and 23 percent (28 students) attended part-time in the fall. This percentage matches the overall rate of degree-seeking main cohort students who attended full-time (76 percent) and part-time (24 percent) in the fall.

2018 Pathway Cohort : Load	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED COHORT TOTAL
Full-Time	57	77	54	140	172	95	91	20	559	579
% of Pathway Cohort	98%	86%	75%	75%	69%	77%	83%	7%	76%	57%
Part-Time	[redacted]	13	18	47	78	28	18	263	181	444
% of Pathway Cohort	2%	14%	25%	25%	31%	23%	17%	93%	24%	43%

Student Demographics by Pathway: Pell Award Status

LCCC Pathway Review : Student Demographics by Pathway

(Embedded in template section I.D.1.b.)

Of the 123 students in the STEM pathway cohort, 26 percent (32 students) received a Pell financial aid award, suggesting that at least one-fourth of STEM pathway students are from low-income backgrounds. This percentage is slightly lower than the overall degree-seeking main cohort students who are Pell award recipients.

2018 Pathway Cohort : Pell Status	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED COHORT TOTAL
Awarded Pell	18	24	18	72	93	32	32	[redacted]	233	234
% of Pathway Cohort	31%	27%	25%	39%	37%	26%	29%	0%	31%	23%
Not Awarded Pell	40	66	54	115	157	91	77	282	507	789
% of Pathway Cohort	69%	73%	75%	61%	63%	74%	71%	100%	69%	77%

One-Year Credit Hour Success by Pathway

LCCC Pathway Review: Credit Hour Success in Year One by Pathway

(Embedded in template section V.C.5.I.b.)

The table below shows the number of officially attempted credits and earned credits (students received a grade of A,B,C, or P). The success rate is the percentage of earned credits out of the attempted credits. STEM's credit success rate in one year is fairly average at LCCC.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL	VFA COHORT
2018 Pathway Cohort											
Attempted Credits in Year 1	1,590	2,091	1,506	4,047	5,199	2,911	2,773	1,187	16,534	17,721	7,414,024
Earned Credits in Year 1	1,401	1,554	1,093	2,845	4,161	2,215	2,320	920	12,924	13,844	5,369,339
Success Rate in Year 1	88%	74%	73%	70%	80%	76%	84%	78%	78%	78%	74%
2018 FTIC Cohort											
Attempted Credits in Year 1	1,411	1,676	1,317	3,445	3,503	2,380	2,188	369	12,908	13,277	4,806,043
Earned Credits in Year 1	1,263	1,298	977	2,376	2,626	1,807	1,804	288	9,935	10,223	3,424,430
Success Rate in Year 1	90%	77%	74%	69%	75%	76%	82%	78%	77%	77%	73%

One-Year Credit Hour Success by Program Group

LCCC Pathway Review: Credit Hour Success in Year One by Program Group

(Embedded in template section V.C.5.I.b.)

The table below shows the number of officially attempted credits and earned credits (students received a grade of A,B,C, or P). The success rate is the percentage of earned credits out of the attempted credits.

	Biology			Biomedical Science				
	AS - NS, Biology	AS - NS, Wildlife Biology	Unduplicated Biology Total	AS - NS, Human Biology	AS - NS, Molecular Biology	AS - NS, Physiology	AS - NS, Zoology	Unduplicated Biomedical Science Total
2018 STEM Program Groups								
Attempted Credits in Year 1	346	298	**611**	453	12	237	372	**1,016**
Earned Credits in Year 1	255	249	**477**	363	12	142	294	**773**
Success Rate in Year 1	74%	84%	**78%**	80%	100%	60%	79%	**76%**
2018 FTIC STEM Program Groups								
Attempted Credits in Year 1	288	234	**522**	447	-	237	348	**974**
Earned Credits in Year 1	213	191	**404**	357	-	142	270	**731**
Success Rate in Year 1	74%	82%	**77%**	80%	n/a	60%	78%	**75%**

	Computer Science			Engineering
	AS - Computer Science	AS - Computers/ Business	Unduplicated Computer Science Total	AS - Engineering Science
2018 STEM Program Groups				
Attempted Credits in Year 1	486	97	**559**	**699**
Earned Credits in Year 1	343	88	**407**	**521**
Success Rate in Year 1	71%	91%	**73%**	**75%**
2018 FTIC STEM Program Groups				
Attempted Credits in Year 1	295	57	**352**	**519**
Earned Credits in Year 1	212	48	**260**	**388**
Success Rate in Year 1	72%	84%	**74%**	**75%**

	Physical Science				STEM Pathway		
	AS - NS, Chemistry (BA)	AS - NS, Chemistry (BS)	AS - NS, Physics	Unduplicated Physical Science Total	AS - Mathematics	UNDUPLICATED STEM TOTAL	VFA COHORT
2018 STEM Program Groups							
Attempted Credits in Year 1	23	93	52	**168**	**162**	**2,911**	**7,414,024**
Earned Credits in Year 1	13	80	12	**105**	**133**	**2,215**	**5,369,339**
Success Rate in Year 1	57%	86%	23%	**63%**	**82%**	**76%**	**74%**
2018 FTIC STEM Program Groups							
Attempted Credits in Year 1	23	93	52	**168**	**112**	**2,380**	**4,806,043**
Earned Credits in Year 1	13	80	12	**105**	**93**	**1,807**	**3,424,430**
Success Rate in Year 1	57%	86%	23%	**63%**	**83%**	**76%**	**73%**

Two-Year Credit Hour Success and Accumulation by Pathway

LCCC Pathway Review : Two-Year Credit Hour Success and Accumulation by Pathway

(Thresholds embedded in template section III.C.2.I.b. ; Credit Success embedded in template section V.C.5.I.b.)

The success rate calculation includes all college-level and developmental-level coursework and excludes dual/concurrent coursework. Credit hours are earned by receiving an A, B, C, or S grade.

The credit threshold calculation is very broad and includes all credit accumulation by the student by the end of the two-year mark (2019 summer). It includes transfer credits, credits earned as a high school student, and any other credits earned by the student before they entered LCCC as a college student, in addition to any credits they earned during the two-year time frame. Further, the definition of "completed" credits for these thresholds includes any credits that can contribute to a credential at LCCC, which may include credits earned outside of receiving an A, B, C, or S grade.

Full-time and part-time status is determined by the student's load during the cohort fall term (2017 fall). The credit hour threshold is different for full-time students and part-time students. The credit hour threshold for full-time students is 42 or more credit hours in two years, and the credit hour threshold for part-time students is 24 or more credit hours in two years. If students earn a credential within the two-year period, then they are also counted as meeting the two-year credit threshold, regardless of how many credit hours they have accumulated.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL
2017 Pathway Cohort										
Attempted Credits in Two Years	2,415	3,055	2,367	6,837	9,832	2,570	3,149	3,832	24,869	28,701
Earned Credits in Two Years	2,020	2,398	1,813	5,114	7,848	1,887	2,547	2,881	19,415	22,296
Success Rate in Two Years	84%	78%	77%	75%	80%	73%	81%	75%	78%	78%
Total Students in 2017 Pathway Cohort	55	87	63	182	262	79	95	301	681	982
Students Reaching Credit Threshold	34	45	27	85	159	41	55	72	375	447
Two-Year Threshold Rate	62%	52%	43%	47%	61%	52%	58%	24%	55%	46%
Total Full-Time Students in 2017 Pathway Cohort	50	70	55	144	188	61	65	35	514	549
Full-Time Students Reaching Credit Threshold	31	34	24	71	113	31	40	16	284	300
Two-Year Full-Time Threshold Rate	62%	49%	44%	49%	60%	51%	62%	46%	55%	55%
Total Part-Time Students in 2017 Pathway Cohort	[redacted]	17	8	38	74	18	30	266	167	433
Part-Time Students Reaching Credit Threshold	[redacted]	11	[redacted]	14	46	10	15	56	91	147
Two-Year Part-Time Threshold Rate	60%	65%	38%	37%	62%	56%	50%	21%	54%	34%

Fall-to-Spring Retention by Pathway

LCCC Pathway Review: Fall-to-Spring Retention by Pathway

(Embedded in template section V.C.5.I.b.)

The table below shows the number and percent of students by pathway who attended LCCC in the fall term and continued to the spring. Graduates are not included in the retention rate. STEM students show a higher fall-to-spring retention rate than any other pathway.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL	VFA COHORT
2018 Pathway Cohort	58	90	72	187	250	123	109	283	740	1,023	431,957
Retained to Spring	48	71	52	145	202	106	83	65	577	642	296,786
% Retained	83%	79%	72%	78%	81%	86%	76%	23%	78%	63%	70%
2018 FTIC Cohort	49	69	60	153	161	91	82	24	543	567	259,532
Retained to Spring	43	57	45	121	130	85	64	16	437	453	192,838
% Retained	88%	83%	75%	79%	81%	93%	78%	67%	80%	80%	74%

Credit Threshold Rates by Pathway

LCCC Pathway Review: Credit Threshold Rates by Pathway

(Embedded in template section III.C.2.I.b.)

The table below includes all students who received an A, B, or C grade in college-level courses. The first term thresholds include credits earned in the fall cohort term, and the first year thresholds include credits earned in the fall, spring, and summer terms. Credits earned prior to the fall cohort term are excluded. Dual/concurrent student credits are excluded. Developmental classes are excluded.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL	VFA COHORT
2018 Pathway Cohort	58	90	72	187	250	123	109	283	740	1,023	431,957
Earned 6+ Credits in First Term	51	67	50	123	175	95	87	31	534	565	235,669
6-Credit Threshold Rate	88%	74%	69%	66%	70%	77%	80%	11%	72%	55%	58%
Earned 12+ Credits in First Term	43	36	29	72	77	48	61	12	306	318	94,792
12-Credit Threshold Rate	74%	40%	40%	39%	31%	39%	56%	4%	41%	31%	25%
Earned 15+ Credits in First Year	47	48	39	97	148	77	74	17	437	454	166,563
15-Credit Threshold Rate	81%	53%	54%	52%	59%	63%	68%	6%	59%	44%	42%
Earned 24+ Credits in First Year	36	39	21	60	81	58	56	11	286	297	81,782
24-Credit Threshold Rate	62%	43%	29%	32%	32%	47%	51%	4%	39%	29%	22%
Earned 30+ Credits in First Year	21	13	[redacted]	24	25	12	32	7	116	123	33,867
30-Credit Threshold Rate	36%	14%	6%	13%	10%	10%	29%	2%	16%	12%	10%

Six-Year Outcomes (Transfer) by Pathway

LCCC Pathway Review : Six-Year Outcomes by Pathway

(Embedded in template sections IV.B.1b.I.b. and V.C.5.I.b.)

The six-year time frame for the outcome measures below encompass 2013 fall through 2019 summer. Any activity outside of this time frame is excluded from the calculations.

The totals for students earning "any" award include any credentials earned between 2013 fall and 2019 summer, regardless of the pathway the student started in.

The totals for students earning a credential "in pathway" include any credentials earned between 2013 fall and 2019 summer that match the **pathway** the student started in. The student may have changed programs within the pathway and still be counted in this total.

The outcome categories listed below are determined in an heirarchical fashion, per VFA definitions. The categories are determined in this order: associate degree, certificate, transfer, still enrolled, left LCCC. The categories are mutually exclusive. The sum of awards, transfers, and still enrolled provides the overall six-year outcomes rate. It acts as a six-year persistence rate that integrates transfer rates into the total.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL
2013 Pathway Cohort	**38**	**66**	**149**	**107**	**223**	**65**	**68**	**491**	**676**	**1,167**
Any Associate (Transfer)	9	8	28	17	30	9	[redacted]	22	99	**121**
Any Associate (Transfer) Rate	24%	12%	19%	16%	13%	14%	7%	4%	15%	**10%**
Any Associate (No Transfer)	6	10	13	9	32	7	[redacted]	23	77	**100**
Any Associate (No Transfer) Rate	16%	15%	9%	8%	14%	11%	4%	5%	11%	**9%**
Any Associate Total	15	18	41	26	62	16	8	45	176	**221**
Any Associate Rate	39%	27%	28%	24%	28%	25%	12%	9%	26%	**19%**
Any Certificate (Transfer)	-	-	-	-	[redacted]	-	[redacted]	-	[redacted]	[redacted]
Any Certificate (Transfer) Rate	0%	0%	0%	0%	0%	0%	1%	0%	0%	**0%**
Any Certificate (No Transfer)	[redacted]	-	[redacted]	-	6	-	11	[redacted]	18	**20**
Any Certificate (No Transfer) Rate	3%	0%	1%	0%	3%	0%	16%	0%	3%	**2%**
Any Certificate Total	[redacted]	-	[redacted]	-	7	-	12	[redacted]	20	22
Any Certificate Rate	3%	0%	1%	0%	3%	0%	18%	0%	3%	**2%**
Total Awards	**16**	**18**	**43**	**26**	**69**	**16**	**20**	**47**	**196**	**243**
Total Awards Rate	**42%**	**27%**	**29%**	**24%**	**31%**	**25%**	**29%**	**10%**	**29%**	**21%**
Transfer (No Award)	12	14	42	40	73	26	[redacted]	316	197	**513**
Transfer (No Award) Rate	32%	21%	28%	37%	33%	40%	4%	64%	29%	**44%**
Still Enrolled in Year 6	[redacted]	[redacted]	[redacted]	[redacted]	13	[redacted]	[redacted]	9	26	**35**
Still Enrolled Rate	3%	2%	3%	2%	6%	3%	3%	2%	4%	**3%**
Persistence (with Transfer) Total	**29**	**33**	**90**	**68**	**155**	**44**	**25**	**372**	**419**	**791**
Persistence Rate	**76%**	**50%**	**60%**	**64%**	**70%**	**68%**	**37%**	**76%**	**62%**	**68%**
Left LCCC, Less Than 30 Credits	6	25	49	33	55	17	35	101	208	**309**
Left, < 30 Credits Rate	16%	38%	33%	31%	25%	26%	51%	21%	31%	**26%**
Left LCCC, 30+ Credits	[redacted]	8	10	6	13	[redacted]	8	18	49	**67**
Left, 30+ Credits Rate	8%	12%	7%	6%	6%	6%	12%	4%	7%	**6%**
Left LCCC Total	**9**	**33**	**59**	**39**	**68**	**21**	**43**	**119**	**257**	**376**
Left LCCC Rate	**24%**	**50%**	**40%**	**36%**	**30%**	**32%**	**63%**	**24%**	**38%**	**32%**

LCCC Pathway Review : Six-Year Outcomes by Pathway

(Embedded in template sections IV.B.1b.I.b. and V.C.5.I.b.)

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL
2013 Pathway Cohort	**38**	**66**	**149**	**107**	**223**	**65**	**68**	**491**	**676**	**1,167**
Associate in Pathway (Transfer)	9	[redacted]	16	12	18	[redacted]	[redacted]	-	65	**65**
Associate in Pathway (Transfer) Rate	24%	6%	11%	11%	8%	5%	4%	0%	10%	**6%**
Associate in Pathway (No Transfer)	[redacted]	[redacted]	[redacted]	6	26	[redacted]	-	-	47	**47**
Associate in Pathway (No Transfer) Rate	11%	6%	3%	6%	12%	3%	0%	0%	7%	**4%**
Associate in Pathway Total	13	8	21	18	44	5	[redacted]	-	112	**112**
Associate in Pathway Rate	34%	12%	14%	17%	20%	8%	4%	0%	17%	**10%**
Certificate in Pathway (Transfer)	-	-	-	-	[redacted]	-	[redacted]	-	[redacted]	[redacted]
Certificate in Pathway (Transfer) Rate	0%	0%	0%	0%	0%	0%	1%	0%	0%	**0%**
Certificate in Pathway (No Transfer)	-	-	-	-	[redacted]	-	11	-	16	**16**
Certificate in Pathway (No Transfer) Rate	0%	0%	0%	0%	2%	0%	16%	0%	2%	**1%**
Certificate in Pathway Total	-	-	-	-	6	-	12	-	18	18
Certificate in Pathway Rate	0%	0%	0%	0%	3%	0%	18%	0%	3%	**2%**
Total Awards in Pathway	**13**	**8**	**21**	**18**	**50**	**5**	**15**	**-**	**130**	**130**
Total Awards in Pathway Rate	**34%**	**12%**	**14%**	**17%**	**22%**	**8%**	**22%**	**0%**	**19%**	**11%**

Two-Year Outcomes by Pathway

LCCC Pathway Review : Two-Year Outcomes by Pathway

(Embedded in template section V.C.5.I.b. ; Transfers also embedded in IV.B.1b.I.b.)

The two-year time frame for the outcome measures below encompass 2017 fall through 2019 summer. Any activity outside of this time frame is excluded from the calculations.

The totals for students earning "any credential" include any credentials earned between 2017 fall and 2019 summer, regardless of the pathway the student started in. The totals for students earning a "credential within pathway" include any credentials earned between 2017 fall and 2019 summer that match the **pathway** the student started in. The student may have changed programs within the pathway and still be counted in this total.

Non-graduate transfer students are defined as students who did not earn "any credential" within the two-year time frame and transferred to another institution (either two-year or four-year) after their last enrollment at LCCC but before the end of 2019 summer. Note that this definition does not include students who waited to transfer for 2019 fall.

All other still enrolled students are defined as students who did not earn "any credential" or transferred within the two-year time frame and were enrolled at LCCC between the start of 2018 fall and the end of 2019 summer. Note that this definition of still enrolled students does not include students who continued at LCCC in 2019 fall.

These three categories (any credential, transfer, and still enrolled) are designed to be mutually exclusive. The sum of these three categories provides the overall two-year outcomes rate. Therefore, the two-year outcomes rate acts as a type of two-year persistence rate that integrates transfer rates into the total.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL
2017 Pathway Cohort	55	87	63	182	262	79	95	301	681	982
Students Earning Any Credential	15	16	11	42	49	9	34	7	145	152
Student Graduation Rate	27%	18%	17%	23%	19%	11%	36%	2%	21%	15%
Students Earning Credential Within Pathway	13	7	9	35	40	[redacted]	31	-	138	138
Student Pathway Graduation Rate	24%	8%	14%	19%	15%	4%	33%	0%	20%	14%
Non-Graduate Transfer Students	14	12	11	23	45	9	9	110	105	215
Non-Graduate Transfer Rate	25%	14%	17%	13%	17%	11%	9%	37%	15%	22%
All Others Still Enrolled in Year Two	18	31	22	57	105	33	17	81	233	314
Still Enrolled Rate	33%	36%	35%	31%	40%	42%	18%	27%	34%	32%
Total Two-Year Outcomes	**47**	**59**	**44**	**122**	**199**	**51**	**60**	**198**	**483**	**681**
Two-Year Outcomes Rate	**85%**	**68%**	**70%**	**67%**	**76%**	**65%**	**63%**	**66%**	**71%**	**69%**

Gateway Course Completion by Pathway

LCCC Pathway Review: Gateway Course Completion by Pathway

(Embedded in template section II.C.1.I.b.)

In the table below, the student must have finished their college-level math or English class during their first year (fall through summer) and with a passing grade (A, B, C) to be counted. Dual/concurrent students and students who completed these courses before their first college-level semester at LCCC are excluded. The math classes include any class with a MATH or STAT prefix and any course number greater than or equal to 1000. The English classes include any class with an ENGL prefix and any course number greater than or equal to 1000. This definition is used by VFA.

	A&E	B&A	CCA	HPS	HSW	STEM	TTS	NDS	DEGREE SEEKING UNDUPLICATED TOTAL	UNDUPLICATED MAIN COHORT TOTAL	VFA COHORT
2018 Pathway Cohort	58	90	72	187	250	123	109	283	740	1,023	431,957
Passed College Math in Year 1	17	41	18	55	90	77	24	24	251	275	110,843
% College Math	29%	46%	25%	29%	36%	63%	22%	8%	34%	27%	27%
Passed College English in Year 1	21	37	32	71	89	58	21	15	259	274	174,388
% College English	36%	41%	44%	38%	36%	47%	19%	5%	35%	27%	41%
Passed College Math and English in Year 1	10	20	11	30	50	44	15	[redacted]	137	140	75,785
% Math and English	17%	22%	15%	16%	20%	36%	14%	1%	19%	14%	18%
2018 FTIC Cohort	49	69	60	153	161	91	82	24	543	567	259,532
Passed College Math in Year 1	15	32	16	43	64	59	17	[redacted]	189	193	76,033
% College Math	31%	46%	27%	28%	40%	65%	21%	17%	35%	34%	30%
Passed College English in Year 1	20	34	28	66	81	52	19	7	237	244	131,015
% College English	41%	49%	47%	43%	50%	57%	23%	29%	44%	43%	49%
Passed College Math and English in Year 1	10	19	9	26	47	39	13	[redacted]	125	126	58,584
% Math and English	20%	28%	15%	17%	29%	43%	16%	4%	23%	22%	22%

STEM Pathway Semester Two Milestones (Initial Fall)

LCCC STEM PATHWAY
2018 Cohort: Semester 1 Milestones (Initial Fall)

Completion of MATH 1400 by the end of semester 1.

STEM Students	Enrolled in MATH*1400	Successful in MATH*1400	Enrollee Success Rate	Milestone Success Rate
123	51	45	88.24%	**36.59%**

Completion of BIOL 1010 by the end of semester 1.
(Biology, Biomedical Science, and Physical Science only)

Natural Science Majors	Enrl BIOL*1010	Success BIOL*1010	Enrollee Success Rate	Milestone Success Rate
66	32	29	90.63%	**43.94%**

Enrollee Success Rate = percent of students who earned a grade of A, B, C, or S or transferred in the credits by the end of the initial fall term (the verified grade date is on or before 12/31 of the cohort term) out of the total number who enrolled/transferred credits.

Milestone Success Rate = percent of students in cohort who successfully earned course credits by the end of the initial fall term (the verified grade date is on or before 12/31 of the cohort term).

STEM Pathway Semester Two Milestones (First Spring)

LCCC STEM PATHWAY
2018 Cohort: Semester 2 Milestones (First Spring)

Completion of ENGL 1010 by the end of semester 2.

STEM Students	Enrolled in ENGL*1010	Successful in ENGL*1010	Enrollee Success Rate	Milestone Success Rate
123	104	91	87.50%	**73.98%**

Completion of BIOL 1010 by the end of semester 2.

STEM Students	Enrolled in BIOL*1010	Successful in BIOL*1010	Enrollee Success Rate	Milestone Success Rate
123	41	37	90.24%	**30.08%**

Completion of MATH 1405 by the end of semester 2.

STEM Students	Enrolled in MATH*1405	Successful in MATH*1405	Enrollee Success Rate	Milestone Success Rate
123	36	29	80.56%	**23.58%**

Enrollee Success Rate = percent of students who earned a grade of A, B, C, or S or transferred in the credits by the end of the initial fall term (the verified grade date is on or before 12/31 of the cohort term) out of the total number who enrolled/transferred credits.

Milestone Success Rate = percent of students in cohort who successfully earned course credits by the end of the initial fall term (the verified grade date is on or before 12/31 of the cohort term).

STEM Pathway Semester Three Milestones (Summer)

LCCC STEM PATHWAY

2018 Cohort: Semester 3 Milestones (Summer)

Completion of MATH 2200 by end of semester 3.
(Computer Science, Engineering, and Physical Science only)

Computer, Engineering, Physical Science Students	Enrolled in MATH*2200	Successful in MATH*2200	Enrollee Success Rate	Milestone Success Rate
61	27	22	81.48%	**36.07%**

Enrollee Success Rate = percent of students who earned a grade of A, B, C, or S or transferred in the credits by the end of the initial fall term (the verified grade date is on or before 12/31 of the cohort term) out of the total number who enrolled/transferred credits.

Milestone Success Rate = percent of students in cohort who successfully earned course credits by the end of the initial fall term (the verified grade date is on or before 12/31 of the cohort term).

I. Ensure that Students Learn: Best Practices in Instruction

All STEM faculty are exposed to, familiar with, and in most cases authors of best practices in instruction. These best practices are discovered and vetted both internally and externally.

Workshops and other training opportunities are offered at LCCC through the Center for Excellence in Teaching and by other faculty and staff with formal training and years of experience in instruction. These opportunities come during In-service days prior to the beginning of a semester and are also available throughout the academic year. Many STEM faculty members have led such trainings where they share their expertise and best practices in instruction. The STEM Pathway currently is staffed by several seasoned instructors with more than 100 years of teaching experience. This wealth of experience provides numerous best practices which are shared throughout the Pathway and throughout the college. This also lends to an effective mentorship within the Pathway for new faculty who join the team. The STEM Pathway has recently hired a few new faculty members who are of world-class talent, and have an excellent mentor group to guide them as they begin their careers at LCCC.

Best practices in instruction are also developed through external entities such as off-site workshops, seminars, webinars, conferences and trainings. All STEM faculty have attended these types of events in one way or another during their time at LCCC and have brought back a number of best practices to the institution. Some of examples are listed below:

- ITC e-Learning Conference
- NISOD Conference
- Canvas Conference – InstructureCon
- AACC Conference
- Esri Education Conference
- WyDEC Conference (three different STEM faculty have won awards over the past 10 years)

Some examples of best practices:

- Use of handheld video devices (iPhones and iPads) for students to use when conducting labs at home to share with their classmates in order to build community

- In-house lab kits packaged and sent out by biology, physics, astronomy, chemistry, geosciences departments for online students to use for real, hands-on lab experiences
- Biology lab manuals written by instructors and tailored to meet the needs of the students in the biology program as well as non-majors taking a lab science course
- Experiential learning in the form of field experiences, site visits, career exploration, and job shadowing

J. Ensure That Students Learn: Effective Educational Practices: Instructional Methods

All programs, as part of the STEM Pathway, employ a diversity of instructional practices to engage students in the field, support rigor of the curriculum, and ensure student learning of the program competencies. The majority of these practices fall under a concept known as High Impact Practices (HIPs), based on the Institute of High Impact Practices promoted by the American Association of Community Colleges. HIPs consist of active and experiential learning, both in the classroom and out in the field. Labs, field trips, and other hands-on activities are common practice throughout the STEM Pathway. Traditional lectures are more uncommon, and interactive discussions during these sessions are becoming the standard in all classes. When students actively participate in a lecture session, lab, field excursion, or other HIPs-based activity, their engagement is increased exponentially. With engagement comes proficiency in the learning competencies and no compromise in rigor.

As mentioned above, the STEM Pathway has always and continues to offer opportunities for applied student experiences. Many of the science labs are based on hands-on, experiential learning where students get to put into practice and apply what they have learned in theory.

Some examples of these opportunities:

- Month-long weather investigation employing tools, technology and techniques for gathering and analyzing weather data; culminating with a final weather report.
- Development of various computer program operations using programming languages, operating systems and techniques.
- Tracking the moon and collecting observable data about its phases during a month-long Moon Project.
- Participating in BioBlitz on campus where a weekend-long categorization of all living things is conducted and led by students, with guests from the community.
- Examining the physical features in real-time during a week-long field experience in Yellowstone and Grand Tetons National Parks.
- Conducting authentic and original research with a team of students and faculty in the undergraduate research class – including writing up and presenting a paper, poster board, and results to an audience at UW's Undergraduate Research Day.
- Partner with local government agencies to set up internships or work experience opportunities in geospatial science (specifically GIS technicians).
- Employ critical thinking skills while assisting, mentoring and assessing high school FFA students competing in the State FFA Environmental and Natural Resources contest held each year at LCCC.
- Exposing students to STEM professionals during their first semester in STRT 1000 as they complete their Career Pathway Exploration Project.
- Field trips to local STEM industries and operations to expose students to a first-hand look at STEM disciplines and knowledge in action (National Weather Service, Wyoming Supercomputing Center, Rawhide Energy Station, USDA Food and Resource Preservation Facility, Microsoft Data Center, Frontier Refinery, Warren AFB Civil Engineering Dept., etc.).

K. Ensure that Students Learn: Student Learning Feedback System

Assessment examples for STEM pathway and discrete degrees

Assessment Tool	Benchmark - Triggers for Change	Timeframe/ Responsible Party	Evaluation Procedure	Change Implementation Mechanism – Closing the Feedback Loop
Scientific reasoning assessment (pre and post-tests)	Goal for post is 78%. Examination of values between pre and post will show areas for opportunity.	Administered each semester in classes as outlined.	Evaluation by a group of pathway faculty annually analyzes the data, and prepares a summary of the results.	Faculty members teaching the in the pathway will discuss and plan for target areas and adjustment to courses.
Scientific literacy assessment (pre and post-tests)	Goal for post is 80%. Examination of values between pre and post will show areas for opportunity.	Administered each semester in classes as outlined.	Evaluation by a group of pathway faculty annually analyzes the data, and prepares a summary of the results.	Faculty members teaching the in the pathway will discuss and plan for target areas and adjustment to courses.
Formative and summative assessments, writing assignments, discussions, common course assessments and various other artifacts depending on the course. (see linked examples in document 'course artifact examples' below)	Determined by individual faculty based on student performance on assignments	Course faculty	Evaluation of assignments and assessments for consistency and relevancy as well as ongoing student performance.	Discussion of results with department level or pathway level group as appropriate for course (or multi course) revisions.
Advisory Committee Input	New industry trends or transfer issues that may indicate a need for change to program competencies.	Advisory Committees will meet annually with Pathway coordinator and faculty to provide feedback and input.	Review results of enrollment and transfer data and learning assessments: Pathway coordinator and faculty will collect recommendations on programming, skill development and opportunities for students.	The Course Faculty in conjunction with the Pathway coordinator will implement Advisory committee recommendations and pursue implementations of identified recommendations through college processes.
Program Enrollment, Student Persistence and Graduation Data	Data that falls below national average will indicate need for change.	Data is collected by the Institutional Research office and analyzed by the Pathway coordinator and faculty annually.	The Institutional Research office collects data and provides it to the STEM Pathway coordinator on each of these factors.	The Pathway coordinator will share data among faculty, seek advisory committee feedback, and implement any needed changes through the college process.

L. Ensure that Students Learn: Story-Line Narrative of Pathway Performance

The STEM Pathway is a new combination of programs, expanding from a core in the natural sciences, and then embedding Math, while adding to previously stand-alone degrees. In 2018, Computer Science was moved from Business, Agriculture, and Technology to the school of Math and Science. Then, in 2019 both Computer Science and Engineering became a part of the STEM pathway. This broad reorganization into Pathways required a great deal of work across all disciplines of STEM to find a way for these programs with some overlap to but some very specific distinctions to all flow from a single pathway. We were the only Pathway that required a completely new degree program. The biggest challenge was trying to identify a common first semester that worked for all discreet programs. This did result in degrees having to accept course work that would not traditionally be found in their degree (i.e. engineering science in biology, and vise versa) but overall the value of the flexibility of allowing a student to explore in science dictated this change.

In doing so, the discrete programs were modified in the following ways:

1. Some course work became narrowly prescriptive. For example, the previous Computer Science degree allowed students to take any lab sciences they wished, but in order to fit the common first semester chemistry and biology became the science courses for Computer Science majors. This was also a requirement of the Passport program LCCC has joined: both a natural and life science course must be taken.
2. Some course work became more flexible. For example, the previous Biology-related programs required either the organic chemistry or physics sequence as written. The degree now allows for taking courses from a pool of acceptable science classes allowing much greater customization of the degree. The other side of this coin is that without advising, the student may end up taking courses in ways that don't contribute to their completion or success at a transfer institution in a timely manner.
3. Several of the prior degree options required a start at Calculus I. Making a conscious choice to recognize that many of our students do not meet that threshold, optional hours were added to the degree so that students could start at MATH 1400. Adding the extra MATH 1400 and MATH 1405 courses to the program required the addition of one summer session to be able to complete the degree in 2 academic school years. Students who are ready to take either MATH 1405 or MATH 2200 their first semester could avoid a summer session and not have to make up additional hours with other courses.

In addition to this major revamping of the program, COVID-19 and the R2B plans forced the STEM pathway into a completely online modality with a variety of both online asynchronous and online synchronous course offerings. This was a massive lift for the faculty and for the students, most of which would have been expecting to have several hands-on lab experiences in the past year. While these modalities are not a good fit for some of our courses and many of our students, it has provided the opportunity for exploration in our offerings and the STEM pathway expects to have a greater breadth of modality offerings going forward so that students can learn in the way that works best for them.

Certainly, getting all this done was a monumental achievement in of itself, and despite this being our first year as a pathway, our true baseline data collection will start in the fall of 2021 for the majority of our students when their experience, expectations and learning are able to better align post pandemic. The most impactful opportunity for the next review cycle will be two-fold:

- First, implementing a robust assessment plan utilizing normed tests to evaluate our student's success and their evaluative skills in science. Just as we were going to start broad level

assessment in the former natural science program, the move to pathways was announced. That plan is being modified to work with the whole stem pathway and we are looking forward to having quality pre and post data in several areas for all of our students.

- Second, monitoring changes to our enrollment and student success with the alteration of our modality and time offerings from an operational standpoint. We are looking forward to taking advantage of the huge amount of learning and experience gained by the STEM faculty during the teaching changes necessitated by the pandemic. Each of our multi-section classes will have varied offerings including traditional day, in-person as well as a flexible (hybrid or online) option for our students that have other demands such as work or family on their time.

M. Program's Previous Action Plan Goals Established in the 2015-16 Cycle

STEM Pathway Program
This program area did not exist in previous cycles of program review

Biology (Natural Sciences) – 2015-16
Description of Action Plan Goal One:
The Natural Science program does not have KPI data for the program, as the program began in the fall of 2015. Based on previous KPI data compiled from the Biology, Chemistry, Wildlife Conservation and Management, and Pre-Pharmacy programs and the General Studies in Sciences and Health Sciences major, we have an average of 83.6 credits to completion for the 2013-2014 academic year.

Without knowing what the combination of these individual programs into the Natural Sciences program, we would like to decrease our average credits to completion to 70 credits (Depending on track the Natural Science program requires 60 - 64 credits for graduation. An additional 6 - 10 credits have been added to account for students that are not college ready and require classes prior to entrance to the Natural Science program) by the next academic year (2016 - 2017)

Description of Action Plan Goal Two:
The Natural Science program does not have KPI data for the program, as the program began in the fall of 2015. Based on previous KPI data compiled from the Biology, Chemistry, Wildlife Conservation and Management, and Pre-Pharmacy programs and the General Studies in Sciences and Health Sciences major, we have a course success rate of 61.8% for the 2014-2015 academic year. Without knowing how the combination of these programs into the Natural Science program will affect the course success rate, we would like to increase our course success rate to 65%.

Description of Action Plan Goal Three:
The Natural Science program does not have KPI data for the program, as the program began in the fall of 2015. Based on previous KPI data compiled from the Biology, Chemistry, Wildlife Conservation and Management, and Pre-Pharmacy programs and the General Studies in Sciences and Health Sciences major, we have a graduation rate for "concentrators" of 3.23%.

Without knowing what the combination of these individual programs into the Natural Sciences program, we would like to increase our graduation rate for "concentrators" to 10%.

Biomedical Science
This program area did not exist in previous cycles of program review

Computer Science – 2014-15
Description of Action Plan Goal One:
Majors will complete their degrees

Description of Action Plan Goal Two:
Increase course completion rates

Engineering – 2016-17
Description of Action Plan Goal One:
The program will work towards increasing the number of its graduates.

N. Current Summary of Review Action Plan Goals (2020-2021 Cycle)

STEM Pathway Action Plan Goals (includes all Pathway programs collectively)

Pillar One: Help Students Choose and Enter a Pathway
Description of Action Plan Goal:
Promote the STEM Pathway as an opportunity for students interested in any field involving the sciences, computer technology, engineering, and math.

Strategies and Actions to Achieve Goal:
The STEM program is designed for students who wish to explore a wide range of career options in science, technology, engineering, or mathematics in anticipation of selecting a degree in one of these specific fields. The key to get students in this Pathway is to remove the stereotypical barriers that deem science and math as "hard" and only certain people are cut out to become scientists. The STEM Pathway's strategy is to encourage and welcome all students who have an interest in STEM-related disciplines and career fields by allowing initial exploration as well as offering advisement on the abundance of careers within STEM which fall outside the traditional math, science and engineering fields.

After the first semester of this program, students will either branch off into a specific STEM program or work closely with their advising team to select appropriate courses.

Projected Time Line for Goal Attainment:
With the launch of Pathways just taking place in Fall 2020, the projected time line to realistically attain this goal would be no sooner than Fall 2022.

Pillar Two: Help Students Stay on Their Path
Description of Action Plan Goal:
Bolster persistence within the STEM Pathway by focusing efforts to assist students in the completion of a college-level Math during their first, no later than second, semester at LCCC. Increase success rates for college-level Math by 15%-20%.

Strategies and Actions to Achieve Goal:
Successfully completing college-level Math is a roadblock for many of our STEM students at LCCC; quite frankly, this is true for all students. It is incumbent upon the STEM Pathway faculty and staff to provide improvement

plans which include strategies and actions to help students who encounter this difficulty. Referring to the attached file below (FirstSemesterCollegeMathFall2020), the data clearly shows the correlation between successful completion of college-level math and persistence to the next semester. The STEM Pathway, and its associate programs, will strive to increase these success rates in Math which will improve the performance of keeping students on their path.

Some strategies and actions:

- Early advisement and mentorship from the STEM PLT on the importance of completing Math
- Early intervention and support for those students struggling in Math during their first semester (i.e., Navigate Alerts, more one on one faculty interaction, promotion of cohort study groups, time spent in STRT 1000 on this issue)
- Strong communication between STEM PLT - mostly through the Pathway Coordinator - and faculty to help facilitate successful Math completion
- Continued improvement in Math Co-requisite classes to assist in student success

Projected Time Line for Goal Attainment:
With the launch of Pathways just taking place in Fall 2020, the projected time line to realistically attain this goal would be no sooner than Fall 2022.

Pillar Three: Clarify Paths to Student End Goals
Description of Action Plan Goal:
The STEM Pathway, as a collective program, shall increase graduation rates by 20%.

Strategies and Actions to Achieve Goal:
With the Pathway model now in place, there is an excellent opportunity to improve upon this pillar. Components of the advising model, including the implementation of a Pathway Coordinator, are currently positioned to bridge the gap which has previously existed in helping students navigate this crucial piece in their academic plan. A number of variables exist for individual students as they get to the point of having to push through from the start of their academic plan to reach the end, or completion of that plan. Clarifying this path and helping students connect to their ultimate goal(s) will be the key to improving in this area.

To achieve this goal, STEM faculty and the STEM Pathway Leadership Team (PLT) will collaborate to discuss student goals and choice points. Decisions that need to be made include, but are not limited to:

- when and how often to communicate with students
- which members of the advising team will contact students at each point
- what to do if a student deviates from their desired path

This action plan supports future development of operational outcomes assessment planning because it will directly impact the actions of the advising team outside the day-to-day classroom activities. Faculty and advisors can meet during in-service to discuss successes and areas for improvement based on the previous semester.

Projected Time Line for Goal Attainment:
In the interest of student success, the three decisions listed above are on-going at the moment and should be fully functioning by the Fall 2021 semester. Attainment of this goal in full, will be set at the end of the next review cycle. However, continuous analysis of completion rate data will be ongoing from year to year with hopes of achieving the goal within the first 2 years of Pathway implementation.

Pillar Four: Ensure That Students Are Learning

Description of Action Plan Goal:

The STEM Pathway and programs within it ensure that pathway, program, and course-level competencies are in alignment. Student learning begins with consistency across the program(s) and a process to where measurable, common data can be analyzed to truly assess how students in the Pathway are learning and where there may be gaps in assessing the competencies.

Below are selected examples of artifacts used in various classes throughout the program to assess student learning related to the program competencies.

General Chemistry I (Chem 1020)		
Program Competency	Linked Course Competency	Assignment Examples
Apply scientific principles to solve problems.	Interpret behaviors of gases using the gas laws and kinetic molecular theory.	Students perform an experiment to determine the standard molar volume of a gas to validate the ideal gas law and the kinetic molecular theory that explains the behavior of gases under common conditions. Students recognize that results from various groups should be comparable and each result should also be comparable to what is predicted using the ideal gas law; students perform error analyses to explain any discrepancies.
Examine the role science plays in historical and contemporary contexts.	Relate the structure of the periodic table and the periodic trends of elemental properties to the quantum mechanical model of atomic structure.	Students comprehend that the modern model to represent the electron structure of an atom came from experimental observations of the behavior of lights and that all scientific theories have limitations and are subject to further development and/or modifications. In an experiment, students build a spectroscope using a cereal box to analyze atomic emission lines and compare the experimentally determined wavelengths of hydrogen Balmer series to what predicted using the Bohr model to examine applicability of the Bohr model and analyze experimental errors. Students also observe the spectra of

		incandescence and fluorescence lights and compare, contrast, and explain the two spectra from light sources. From this activity, students comprehend how the study of the behavior of light has led to the model that describes the electron structure of an atom.
General Biology (BIOL1010)		
Program Competency	Linked Course Competency	Assignment Examples
Evaluate primary scientific or technical literature.	Analyze scientific literature using interpretation, evaluation, and summarization.	Throughout the course, students evaluate four primary literature papers published in scientific journals (primarily Nature). Students summarize the paper overall, and then conduct a critical analysis of the contributions to society, the shortcomings of the work and its relevancy to their lives. The skills are developed over the semester with increasingly higher expectations over each assignment.
Explain ethical scientific behavior	Demonstrate use of the scientific method.	Students have group discussions and complete an assignment to become familiar with the nature of science and also to evaluate the many forms of bias in consideration of how it can influence their thinking. Further, students will then reflect on how their personal biases have impacted their data collection and analysis on lab experiments throughout the course.
Programming (COSC 2409)		
Program Competency	Linked Course Competency	Assignment Examples
Students design algorithms to solve a variety of problems using programming constructs and data structures.	Analyze computer code execution with known test data to find and correct bugs	Students will download data in the Python Programming language and analyze and reformat that data using their own skills and innovation over the course of several iterations through the semester.

Strategies and Actions to Achieve Goal:

Instructors use MCORs and syllabi to ensure that competencies are communicated and taught to students. Various teaching resources, modalities, and types of assessments are utilized to foster an engaging and inspiring learning experience, and to allow students to have multiple ways to demonstrate learning. The Pathway makes use of its network (advisory committee) and technology, such as Navigate, to assist students, collaborate with faculty and advisors, and share feedback. Students successfully make progress toward graduation.

Projected Time Line for Goal Attainment:

Most of the actions in the plan above may be carried out right away or by the end of 2021. However, gathering and analyzing data to assess whether the plan is working will take at least one year, thus, no sooner than Fall 2022.

O. Identified Strengths, Concerns, Opportunities, and Challenges for Student Learning and Program Operations Resulting from the Review Process

Below is a list of Strengths, Weaknesses, Opportunities, and Threats which are relevant to the STEM Pathway Program as well as all specific programs in the Pathway.

Strengths:

- Individual student course success - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Collaborative, world-class faculty - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Community engagement - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path*
- Technology and equipment for individual classrooms - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Ensure That Students Are Learning*
- Grant Attainment - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Service to other pathways through curriculum - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Transparent and realistic math attainment goals for all students - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- PLT implementation - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Active Learning approaches - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Guided flexible programming - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*

Weaknesses:

- Degree Completion - *Help Students Stay on Their Path, Clarify Paths to Student End*
- Transfer Rates - *Clarify Paths to Student End Goals*
- Student Learning Assessment - *Ensure That Students Are Learning*

- Physical Campus Locations and Space restrictions - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Internal infrastructure (Need more electricity) - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- English Completion in a student's first year - *Help Students Stay on Their Path, Ensure That Students Are Learning*
- Identification of Gateway courses and Milestones outside of Math and English completion in a student's first year - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Clear identification of the role of advisory committee - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*

Opportunities:

- High pay for graduates of STEM - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- STEM is a community buzz word - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Business and industry collaboration within the community - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Expansion of undergraduate research - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Increased contextualization of STEM STRT - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Increased access to quality OER resources for faculty and students - *Help Students Stay on Their Path, Ensure That Students Are Learning*

Threats:

- Continued Enrollment problems post Pandemic - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Funding for technology relevance - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Loss of faculty due to other competitive opportunities - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Low enrollment due to increased entry-level job availability and pay structure - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*

P. Academic Standards Committee Action on Academic Program Reviews for 2019-2020

Central functions of the APR Subcommittee are to engage the program review process, provide feedback for program faculty who prepare self-studies, and make recommendations to the ASC regarding the status of said program reviews (Procedure 2.12). During the AY 2020-2021 program review cycle, the STEM Pathway utilized a new Pathway Review Template, which was developed by the APR Task Force 2020 during spring and summer of 2020.

The STEM Pathway includes six programs: Biology, Biomedical Sciences, Computer Science, Engineering, Physical Science and STEM Pathway. These six programs, completed six self-studies, each with three common Pathway sections I, II, and III as well as three program-specific sections IV, V, and VI; four of these sections relate directly to the four Pathway pillars. This 2020-2021 review was designated as a "start -up review" in that it was the initial review of the Pathway process at LCCC. There was little historical evidence available for this Pathway because the review's final year in cycle included the first year of Pathways implementation at LCCC; the Institutional Research data focused on pre-Pathway, program experiences. The table below outlines the APR Subcommittee recommendations for these six programs. On October 1, 2021, the full Academic Standards Committee voted to accept the APR Subcommittee recommendations.

Acceptance of Program Review with no Contingencies	
STEM Pathway Program	Computer Science Specific Program
Biology Specific Program	Engineering Specific Program
Biomedical Sciences Specific Program	Physical Science Specific Program

Appendix B:

Best Practices: STEM Pathway Review

IV.A.4: Relevancy of the Program's Curriculum

Standard: The Program sustains relevancy in its curriculum using strategies such as aligning to professional standards or best practices, and responding regularly to stakeholder needs.

Guideline: Describe the Program's process for designing and maintaining relevancy in its curriculum and MCORS activity such as aligning with professional standards or best practices, and by regularly responding to stakeholders' needs.

Program Self-Study Narrative

Students in the STEM pathway complete coursework intended to prepare them for careers in a variety of scientific disciplines. Students complete coursework designed to introduce basic concepts and techniques applicable to all STEM fields, such as the scientific method, basic concepts in inductive reasoning, use of the metric system, and scientific literacy. The STEM pathway is further supplemented by 5 discrete degrees (Biology, Biomedical science, Computer Science, Engineering and Physical Science) that prepare students to complete 4-year science degrees (after transfer to a different institution).

STEM pathway courses utilize a curriculum (i.e., MCORS) aligned to the professional standards of the disciplines and programs that it serves. One specific example of how this is applied is the Zoology department as courses in this area are requirements or electives in both the Biological Science and Biomedical Science degree pathways. The Zoology Program uses a curriculum aligned to the national HAPS (Human Anatomy and Physiology Society) standards. HAPS is a national-level organization that develops a standard curriculum to be utilized by both community colleges and four-year universities, and HAPS members are eligible to receive training and accreditation by the society. This approach is also utilized in Chemistry with implementation of standardized tests provided by the American Chemical Society.

In addition, the STEM pathway faculty interact with their various stakeholders regularly (through individual connections and our STEM advisory committee) to gather information on the needs our courses must meet. For example, the STEM faculty broadly interact with their counterparts at the other WY community colleges and the University of Wyoming through annual articulation meetings. Further, Zoology faculty also consult with internal stakeholders such as the program directors of the various Health Science programs offered at Laramie County Community College (dental hygiene, nursing, radiography, sonography, physical therapist assistant) to ensure that the introductory courses in Anatomy & Physiology (ZOO 2010, ZOO 2015, ZOO 2020, ZOO 2025) meet the needs of students applying to these programs.

Introductory courses in the STEM pathway emphasize scientific literacy. Students in introductory Biology, Chemistry and Zoology courses are required to read and summarize peer-reviewed scientific literature as part of their course work and training to think like professional scientists. Students in many science courses complete assignments meant to simulate real world scenarios to practice their critical thinking skills and to relate the theoretical concepts learned in class to applied to real world contexts. This critical thinking is an example of the type of scientific reasoning.

Instructors in the STEM pathway endeavor to follow Best Practices in the instruction of their courses. Many instructors have been recognized for their excellence in this regard. Dr. Marie Yearling (Instructor of Microbiology) is the 2019 recipient of the WyDEC Innovative Educatory of the Year award in recognition of her excellence in team-based instruction and online content delivery.

Members of the STEM pathway also regularly rely on the use of standardized testing to evaluate the success of student learning. Two examples of this are the Scientific Literacy Concept Inventory Test and the Modified Lawson Classroom Test of Scientific Reasoning. Each of these can be used to evaluate student performance and to evaluate student achievement relative to MCORS and specific program competencies (e.g., scientific literacy), as well as be used to compare to national performance. Results from these tests are used to evaluate instructional methodology and to aid in the development of new instructional content. Dr. Brian Uzpen (Instructor of astronomy/physics) recently used a sabbatical to produce a program-level assessment plan for students in the Natural Science Program which will now be modified and expanded to serve the STEM pathway.

V.A.3: **Best Practices in Instruction**
Standard: Programs discover best practices in their instructional methods overtime.

Guideline: Describe how best practices in instruction are identified (e.g., professional development opportunities or research efforts) and discuss evidence of utilizing best practices in instruction (e.g., course-based artifacts).

Program Self-Study Narrative
All STEM faculty are exposed to, familiar with, and in most cases authors of best practices in instruction. These best practices are discovered and vetted both internally and externally.

Workshops and other training opportunities are offered at LCCC through the Center for Excellence in Teaching and by other faculty and staff with formal training and years of experience in instruction. These opportunities come during In-service days prior to the beginning of a semester and are also available throughout the academic year. Many STEM faculty members have led such trainings where they share their expertise and best practices in instruction. The STEM Pathway currently is staffed by several seasoned instructors with more than 100 years of teaching experience. This wealth of experience provides numerous best practices which are shared throughout the Pathway and throughout the college. This also lends to an effective mentorship within the Pathway for new faculty who join the team. The STEM Pathway has recently hired a few new faculty members who are of world-class talent, and have an excellent mentor group to guide them as they begin their careers at LCCC.

Best practices in instruction are also developed through external entities such as off-site workshops, seminars, webinars, conferences and trainings. All STEM faculty have attended these types of events in one way or another during their time at LCCC and have brought back a number of best practices to the institution. Some of examples are listed below:

- ITC e-Learning Conference
- NISOD Conference
- Canvas Conference – InstructureCon
- AACC Conference
- Esri Education Conference
- WyDEC Conference (three different STEM faculty have won awards over the past 10 years)

Some examples of best practices:

- Use of handheld video devices (iPhones and iPads) for students to use when conducting labs at home to share with their classmates in order to build community
- In-house lab kits packaged and sent out by biology, physics, astronomy, chemistry, geosciences departments for online students to use for real, hands-on lab experiences

- Biology lab manuals written by instructors and tailored to meet the needs of the students in the biology program as well as non-majors taking a lab science course
- Experiential learning in the form of field experiences, site visits, career exploration, and job shadowing

V.C.4: **Annual Program Assessment Plans for Operational Outcomes**
Standard: Program maintains annual assessment planning for researching performance on program-level operational outcomes that includes annual updating of planning, reporting of data with a summary analysis, and identifying improvements.

Guideline: Using the displayed operational assessment plans (imported from Campus Labs planning module), Programs explain how they annually maintain assessment planning, discuss some of the changes made to planning over the review cycle based on data reporting, and provide one example of an improvement that emerged from planning efforts.

Program Self-Study Narrative
Our prior organizational effectiveness outcomes were to increase graduation rates and to develop an external advisory committee. With the complete remodel of our programs and the umbrella of the STEM pathway, these prior no longer make sense in their previous iteration.

While we will retain the goal of implementing and making heavy use of our external advisory committee as required through the Pathway initiative, the composition of the committee will reflect the entire STEM group and provide input on areas ranging from curriculum to student skills to high impact experiences as detailed elsewhere in this review.

Our new assessment plan will be to evaluate impacts on both enrollment and student success by a wide ranging diversification of modalities and class times to make sure that we are meeting the needs of our various student stakeholders (traditional and non-traditional students, full-time and part-time attendees, and those students that have external commitments such as work or dependents).

**As a side note, we are functionally considering the fall of 2021 to be the start of our programs for this aspect, given the modalities and student experiences during this past year have been extraordinary due to the Covid-19 pandemic.

Starting in the fall of 2021, each of our multi section offerings (BIOL1010, CHEM1020, COSC1010) required in the first year will be offered in a way to try to intentionally accommodate these different groups - both in their need of when they want the class, and also to allow them to decide how they learn best (i.e. independently, or in a traditional setting). Our hypothesis is that this will reach a greater number of students (increasing enrollment) and will allow for increased persistence by making sure that students are able to get the classes they need in a way that works with their lives. Beyond the first year, some of the other multi section offerings that are available to students in STEM areas will also be offered this way (General Chemistry II, Geography, Anatomy, Physiology and Microbiology) will also make this adjustment to provide a path forward for degree completion for a student that is unable to attend classes face to face during the day hours.

The Pathway faculty will evaluate the data from IR on these aspects, and will also gather information from the students directly as appropriate on their preferences for course work. Further, when class offering conflicts become known through the advising process, we will ask that those be communicated to the pathway coordinator immediately so that he can work with the scheduling faculty to identify solutions.

V.D.1: **Story-Line Narrative of Pathway Performance**

Standard: Comprehensive Pathway reviews reveal Program achievements over the review cycle, show evidence of self-evaluation, and identify areas or opportunities for future success

Guideline: For the above pillar section, identify achievements made during the review cycle, report efforts for evaluating performance, and describe areas or opportunities for future success. Describe the most impactful opportunity for improvement over the next program assessment cycle and provide rationale for its selection.

Program Self-Study Narrative

The STEM Pathway is a new combination of programs, expanding from a core in the natural sciences, and then embedding Math, while adding to previously stand-alone degrees. In 2018, Computer Science was moved from Business, Agriculture, and Technology to the school of Math and Science. Then, in 2019 both Computer Science and Engineering became a part of the STEM pathway. This broad reorganization into Pathways required a great deal of work across all disciplines of STEM to find a way for these programs with some overlap to but some very specific distinctions to all flow from a single pathway. We were the only Pathway that required a completely new degree program. The biggest challenge was trying to identify a common first semester that worked for all discreet programs. This did result in degrees having to accept course work that would not traditionally be found in their degree (i.e. engineering science in biology, and vise versa) but overall the value of the flexibility of allowing a student to explore in science dictated this change.

In doing so, the discrete programs were modified in the following ways:

1. Some course work became narrowly prescriptive. For example, the previous Computer Science degree allowed students to take any lab sciences they wished, but in order to fit the common first semester chemistry and biology became the science courses for Computer Science majors. This was also a requirement of the Passport program LCCC has joined: both a natural and life science course must be taken.
2. Some course work became more flexible. For example, the previous Biology-related programs required either the organic chemistry or physics sequence as written. The degree now allows for taking courses from a pool of acceptable science classes allowing much greater customization of the degree. The other side of this coin is that without advising, the student may end up taking courses in ways that don't contribute to their completion or success at a transfer institution in a timely manner.
3. Several of the prior degree options required a start at Calculus I. Making a conscious choice to recognize that many of our students do not meet that threshold, optional hours were added to the degree so that students could start at MATH 1400. Adding the extra MATH 1400 and MATH 1405 courses to the program required the addition of one summer session to be able to complete the degree in 2 academic school years. Students who are ready to take either MATH 1405 or MATH 2200 their first semester could avoid a summer session and not have to make up additional hours with other courses.

In addition to this major revamping of the program, COVID-19 and the R2B plans forced the STEM pathway into a completely online modality with a variety of both online asynchronous and online synchronous course offerings. This was a massive lift for the faculty and for the students, most of which would have been expecting to have several hands-on lab experiences in the past year. While these modalities are not a good fit for some of our courses and many of our students, it has provided the opportunity for exploration in our offerings and the STEM pathway expects to have a greater breadth of modality offerings going forward so that students can learn in the way that works best for them.

Certainly, getting all this done was a monumental achievement in of itself, and despite this being our first year as a pathway, our true baseline data collection will start in the fall of 2021 for the majority of our students when

their experience, expectations and learning are able to better align post pandemic. The most impactful opportunity for the next review cycle will be two-fold:

- First, implementing a robust assessment plan utilizing normed tests to evaluate our student's success and their evaluative skills in science. Just as we were going to start broad level assessment in the former natural science program, the move to pathways was announced. That plan is being modified to work with the whole stem pathway and we are looking forward to having quality pre and post data in several areas for all of our students.
- Second, monitoring changes to our enrollment and student success with the alteration of our modality and time offerings from an operational standpoint. We are looking forward to taking advantage of the huge amount of learning and experience gained by the STEM faculty during the teaching changes necessitated by the pandemic. Each of our multi-section classes will have varied offerings including traditional day, in-person as well as a flexible (hybrid or online) option for our students that have other demands such as work or family on their time.

VI.A: **SWOT Analysis**

Standard: Programs use the Pathway Review process to develop a summary of strengths, weaknesses, opportunities, and threats that support selection of action plan goals.

a. Guideline: The Pathway program, and each specific program provides a listing of strengths, weaknesses, opportunities, and threats that emerged as a result of the Pathway Review process including all four Pathway pillars. A SWOT list should be developed for each of the four pillars.
b. Guideline: Programs describe at least one relationship or alignment existing between SWOT items and their development of action plans.

Program Self-Study Narrative

Below is a list of Strengths, Weaknesses, Opportunities, and Threats which are relevant to the STEM Pathway Program as well as all specific programs in the Pathway.

Strengths:

- Individual student course success - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Collaborative, world-class faculty - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Community engagement - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path*
- Technology and equipment for individual classrooms - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Ensure That Students Are Learning*
- Grant Attainment - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Service to other pathways through curriculum - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Transparent and realistic math attainment goals for all students - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- PLT implementation - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Active Learning approaches - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Guided flexible programming - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*

Weaknesses:

- Degree Completion - *Help Students Stay on Their Path, Clarify Paths to Student End*
- Transfer Rates - *Clarify Paths to Student End Goals*
- Student Learning Assessment - *Ensure That Students Are Learning*
- Physical Campus Locations and Space restrictions - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Internal infrastructure (Need more electricity) - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- English Completion in a student's first year - *Help Students Stay on Their Path, Ensure That Students Are Learning*
- Identification of Gateway courses and Milestones outside of Math and English completion in a student's first year - *Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Clear identification of the role of advisory committee - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*

Opportunities:

- High pay for graduates of STEM - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- STEM is a community buzz word - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Business and industry collaboration within the community - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Expansion of undergraduate research - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Increased contextualization of STEM STRT - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Increased access to quality OER resources for faculty and students - *Help Students Stay on Their Path, Ensure That Students Are Learning*

Threats:

- Continued Enrollment problems post Pandemic - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*
- Funding for technology relevance - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Loss of faculty due to other competitive opportunities - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals, Ensure That Students Are Learning*
- Low enrollment due to increased entry-level job availability and pay structure - *Help Students Choose and Enter a Pathway, Help Students Stay on Their Path, Clarify Paths to Student End Goals*

b. Guideline: Programs describe at least one relationship or alignment existing between SWOT items and their development of action plans.

The action plan developed by the STEM Pathway which has the most significant relationship to several items within the Pathway's SWOT analysis is **Helping Students Stay on Their Path.** In this action plan, the goal is to "*Bolster persistence within the STEM Pathway by focusing efforts to assist students in the completion of a college-level Math during their first, no later than second, semester at LCCC. Increase success rates for college-level Math by 15%-20%".* Within the SWOT analysis above, this is the most critical pillar that is addressed and is the key for getting STEM students to the "finish line" in all programs.

The one particular example is listed under Weaknesses which has to do with degree completion. It has been stated many times throughout this review, and backed by previous data collected for STEM degrees, that completion rates within the STEM disciplines is low compared to other disciplines throughout the institution; although not completely unique. With the launch of the Pathways model and the redesigning of some STEM disciplines within the Pathway, the opportunity to increase these completion rates is evident. This in turn will help clarify the path to students' end goals, which in the case of the STEM Pathway is to successfully articulate into a transfer program to continue academic progress towards a B.S. degree and beyond.

Appendix C:

Stem Pathway Review 2020-2021 Cycle: Pathway-Level Peer Review Ratings for Self-Study Sections

STEM Pathway Review 2020-2021 Cycle: Pathway-Level Peer-Review Ratings for Self-Study Sections

*Peer-review rubric ratings from six programs were averaged (STEM, Biology, Biomedical Sciences, Computer Science, Engineering, Physical Science).

I.	GENERAL PATHWAY OVERVIEW	Total
A.	**INTRODUCTION OF THE PATHWAY**	
1.a	Describe the overarching context of the Pathway and how each program included in the Pathway interconnects within this context. The Pathway's context should be provided for external review but will not be rated.	
2.a	Describe how the Pathway Program provides academic support to the Pathway and the specific Programs in the Pathway.	3.13
B.	**PATHWAY ORGANIZATIONAL STRUCTURE**	
1.a	Describe how the Pathway's organizational structure, consisting of the Dean, Pathway Coordinator, Pathway Advisor, and Lead Mentor, functions and explain how it sustains process continuity (e.g., conducting enrollment management, curriculum management, resource development, or program-level learning assessment); and develops effective communication throughout the Pathway.	2.88
C.	**LCCC'S MISSION, VISION, VALUES**	
1.a	State the Pathway's mission statement and explain how it relates to the LCCC Mission. Describe how the Pathway directs students' program completion (Transform), and describe how the Pathway inspires student learning.	3.00
1.b	Identify the Pathway's primary purpose (student preparation, student transfer, workplace preparation, community engagement). Summarize how the Pathway carries out its primary purpose.	3.00
2.a	State the Pathway's core and/or aspirational value statements. Explain how the Pathway's value statements are accomplished.	2.96
2.b	Describe the process the Pathway uses to share its mission and values across internal and external stakeholders.	2.83
2.c	Describe how the Pathway aligns its mission and values with internal and external stakeholder needs. Explain how well the Pathway values align with specific program achievements and planning.	2.79
2.d	Provide at least one example that demonstrates how mission and values are used for guiding the Pathway activities or events.	3.08
D.	**STUDENT DEMOGRAPHICS**	
1.a	Provide the general student characteristics for the Pathway. Pathway Coordinators should monitor this information annually. The Pathway's general student characteristics should be provided for external review but will not be rated.	
1.b	Data-Embedded Area	
E.	**JOB AND TRANSFER OPPORTUNITIES AND MANAGING PATHWAY RESPONSIVENESS**	
1.a	Describe how the Pathway researches, communicates, and sustains its job and transfer opportunities.	2.75

2.a	Describe the Pathway's system or data gathering process used to inform Pathway-level decision making on programmatic change that effectively responds to current job and transfer opportunities.	3.00
2.b	Describe the resources the Pathway provides to programs so that they can carry out Pathway level decisions on programming. Resources might include tools such as common job demand software or archival infrastructure that enables programs to manage their transfer institution agreement inventories or maintain updated employer listings that can be shared with students and others.	3.21
2.c	The Pathway reports its annual Pathway-level transfer rates and job placement rates and describes their relationship to Pathway responsiveness to transfer institution and workforce demand.	3.00
	SECTION AVERAGE	**2.97**
II.	**HELP STUDENTS CHOOSE AND ENTER A PATHWAY**	**Total**
A.	**COMMUNITY OUTREACH AND ENGAGEMENT**	
1.a	Describe how the Pathway's events have offered students the opportunity to build relationships with career or transfer partners.	2.91
1.b	Describe how the Pathway's events build a community of learners early in their college experience.	2.72
2.a	Describe how the Pathway engages with Student Services to promote and market the Pathway.	2.86
2.b	Describe how the Pathway engages with Student Services to recruit students.	2.82
B.	**PATHWAY EXPLORATION**	
1.i.a	Describe how the Pathway is organized to encourage students to explore courses that will lead them to choose a career path.	3.07
1.ii.a	Describe how the Pathway-specific STRT 1000 course(s) is designed to encourage students to explore various careers.	3.34
C.	**GATEWAY COURSES**	
1.a	The Pathway/Program will examine the provided IR gateway course data to inform its description of how course performance has affected student progress through the Program. It shall describe actions taken over time to make adjustments, if needed, and how discussions with gateway course faculty and deans were utilized to assist decision-making.	2.75
1.b	Data-Embedded Area	
D.	**DISCOVERIES AND ACTION ITEMS FOR HELP STUDENTS CHOOSE AND ENTER A PATHWAY**	
1.a	For the above pillar section, identify achievements made during the review cycle, report efforts for evaluating performance, and describe areas or opportunities for future success. Describe the most impactful opportunity for improvement over the next program assessment cycle and provide rationale for its selection.	2.99
2.a	List the Pathway or Pathway program's recommendations for improvement of this pillar's performance.	3.00
2.b	Describe how the Pathway plans for future success and improvement by developing an action plan(s) based on the above Pathway review self-study discoveries, data, and stakeholder feedback. Explain how the action plan(s) supports future development of annual assessment planning (either learning competencies or operational outcomes). Use the Campus Labs planning module to report the action plan(s). See attached instructions.	3.00

2.c	Provide a timeline for accomplishing action plans that are to be carried out between Pathway review periods.	3.00
	SECTION AVERAGE	**2.95**
III.	**HELP STUDENTS STAY ON THEIR PATH**	**Total**
A.	**EMBEDDED AND ONGOING ADVISING**	
1.a	Describe how the Pathway Coordinator, academic and faculty advisors, and Pathway faculty create, maintain, and monitor the progress of students in their chosen Pathway.	3.04
1.b	Describe intervention strategies used and provide an example of their success.	3.05
B.	**PREDICTABLE SCHEDULES**	
1.a	Describe how the Program collaborates with Pathway faculty members and the Dean to schedule classes to meet students' needs. Explain how students' scheduling needs are determined.	3.24
1.b	Describe the program's configuration of face-to-face, hybrid, and remote learning; and explain why this configuration of modality meets students' needs.	3.08
1.c	Describe how the Program uses summer courses to serve the needs of part-time and developmental students.	2.90
C.	**MONITOR STUDENT PROGRESS**	
1.a	The Pathway explains its process for monitoring students' adherence to Choice Points and describes how well the students' adherence to Choice Points is working for student success by analyzing data metrics such as: (a) Students who were in Pathway in fall (full time); (b) Of those students, how many at the beginning of spring were in the same Pathway, declared a discrete program within the Pathway, or changed to a new Pathway; (c) Repeat (b) for the same cohort for the next fall.	2.95
1.b	Data-Embedded Area	
2.a	Discuss how tracking of milestones is occurring. Include how milestones were identified and how milestones are assisting students in progressing through and completing their degree. Explain how achievement of milestones are communicated to students.	2.80
2.b	Data-Embedded Area	
D.	**PERSISTENCE SUPPORTS**	
1.i.a	Describe the academic supports that the Pathway has embedded within students' programs. Some examples include STRT sessions on study/test-taking, co-curricular experiences, ePortfolios, and team projects. Provide one example of a successful academic support strategy.	3.11
1.ii.a	Describe the non-academic supports that the Pathway has embedded within students' programs. Some examples include early alert and intervention, letters of milestone recognition, career counseling, and community building. Provide one example of a successful non-academic strategy.	3.00
2.a	Describe how the communities of interest within this Pathway help students make informed choices and strengthen clarity about transfer and career opportunities. Explain what relationships and strategies contribute to developing the integrity or soundness of the communities of interest.	3.08

2.b	Describe how the communities of interest within the Pathway offer support throughout students' programs to promote student learning and persistence, e.g., provide sharing technologies (Microsoft Teams) to a group for facilitating organizational learning, engagement experiences with employers or workplace visits, group research of a common field-based problem, common/shared usage of field-based technologies, or others.	3.11
E.	**DISCOVERIES AND ACTION ITEMS FOR HELP STUDENTS STAY ON THEIR PATH**	
1.a	For the above pillar section, identify achievements made during the review cycle, report efforts for evaluating performance, and describe areas or opportunities for future success. Describe the most impactful opportunity for improvement over the next program assessment cycle and provide rationale for its selection.	2.82
2.a	List the Pathway or Pathway program's recommendations for improvement of this pillar performance.	3.02
2.b	Describe how the Pathway plans for future success and improvement by developing an action plan(s) based on the above Pathway review self-study discoveries, data, and stakeholder feedback. Explain how the action plan(s) supports future development of annual assessment planning (either learning competencies or operational outcomes). Use the Campus Labs planning module to report the action plan(s). See attached instructions.	3.05
2.c	Provide a timeline for accomplishing action plans that are to be carried out during those years between Pathway review periods.	3.08
	SECTION AVERAGE	**3.02**
IV.	**CLARIFY PATHS TO STUDENT END GOALS**	**Total**
A.	**PROGRAM DESCRIPTION**	
1.a	Programs should provide a link to a broad Program summary resource not necessarily restricted to this pillar (not to be rated).	
2.a	The Program will provide a list of measurable and demonstrated achievements over the past five years that relate to the Pathway's values and priorities.	3.32
3.a	Provide the web links to the Program's curriculum and MCORS for review (not to be rated).	
4.a	Describe the Program's process for designing and maintaining relevancy in its curriculum and MCORS activity such as aligning with professional standards or best practices, and by regularly responding to stakeholders' needs.	3.13
B.	**CAREER ALIGNMENT RELATIONSHIPS AND STUDENT OUTCOMES**	
1.i.a	Transfer programs describe how they use the general Pathway Advisory Committee or their specific Program Advisory Committee (based on the LCCC Advisory Committee Handbook) to develop and sustain meaningful relationships with faculty at receiving institutions and other stakeholders to achieve career alignment outcomes.	3.11
1.i.b	Transfer programs provide evidence of current alignments between course competencies and receiving institution expectations, courses, course descriptions or program level competencies. (Pathway coordinators are to develop metrics for this guideline based on the LCCC Advisory Committee Handbook)	3.14
1.ii.a	Transfer programs use transfer metrics to illustrate the effectiveness of program-level articulation agreements and/or relationships in ensuring a seamless transfer Pathway for students.	2.74
1.ii.b	Data-Embedded Area	

2.i.a	A.A.S., certificate, and credit diploma programs describe how they use either the general Pathway Advisory Committee or their own specific Program Advisory Committee (based on the LCCC Advisory Committee Handbook) to develop and sustain meaningful relationships with employers to achieve career alignment outcomes.	
2.i.b	A.A.S., certificate, and credit diploma programs provide evidence of current alignments between course competencies and workplace job competencies. (Pathway coordinators are to develop metrics based on the LCCC Advisory Committee Handbook)	
2.ii.a	A.A.S., certificate, and credit diploma programs use workplace metrics to illustrate the effectiveness of their career alignments with employers.	
2.ii.b	Data-Embedded Area	
C.	**DISCOVERIES AND ACTION ITEMS FOR CLARIFY PATHS TO STUDENT END GOALS**	
1.a	For the above pillar section, identify achievements made during the review cycle, report efforts for evaluating performance, and describe areas or opportunities for future success. Describe the most impactful opportunity for improvement over the next program assessment cycle and provide rationale for its selection.	2.81
2.a	List Pathway program's/specific program's recommendations for improvement of this pillar performance.	3.03
2.b	Describe how the Pathway program/specific program plans for future success and improvement by developing an action plan(s) based on the above Pathway review self-study discoveries, data, and stakeholder feedback. Explain how the action plan(s) supports future development of annual assessment planning (either learning competencies or operational outcomes). Use the Campus Labs planning module to report the action plan(s). See attached instructions.	2.91
2.c	Provide a timeline for accomplishing action plans that are to be carried out during those years between Pathway review periods.	2.78
	SECTION AVERAGE	**3.00**
V.	**ENSURE THAT STUDENTS ARE LEARNING**	**Total**
A.	**PEOPLE OF THE PROGRAM**	
1.a	The Program describes how it encourages and sustains positive faculty-to-student relationships that lead to student success and contribute to the Pathway's achievements.	2.92
1.b	The Program explains how faculty members' practices in student learning, teaching, and engagement lead to student achievement.	2.89
2.a	The Program describes the professional development experiences of the full-time faculty over the review period and explains how they support students' learning of the Program competencies, align with faculty competencies plus myPATH goals, and result in best practices in instruction.	2.82
2.b	The Program describes its faculty community approach to professional development and how it engages adjunct faculty to participate in the strengthening of student learning.	2.94
3.a	Describe how best practices in instruction are identified (e.g., professional development opportunities or research efforts) and discuss evidence of utilizing best practices in instruction (e.g., course-based artifacts).	2.76
4.i.a	The Program describes the diversity of instructional practices it uses and explains how they collectively engage students in the field, support rigor of the curriculum and ensure student learning of the Program's competencies.	2.79

4.i.b	The Program describes how it develops opportunities for applied student experiences such as internships, clinicals, field-based research projects/papers, hands on fabrication or crafting of artifacts, field or technology immersion projects, labs, and others.	2.65
4.ii.a	The Program describes the resources it uses to support student learning success such as: performance or instructional spaces, equipment, technology, library learning resources, and clinical/internship sites.	3.02
B.	**PROGRAM-LEVEL LEARNING COMPETENCIES**	
1.a	List the Program's learning competencies and describe how they support student success in employment or further education in related fields. Programs provide a summary of data/evidence (program artifacts, employer and alumni surveys, student perceptions of the value of competencies in the workplace or for transfer success) that support the program's description of student success.	2.98
C.	**VERIFYING STUDENT LEARNING**	
1.a	The Program uploads its current curriculum map and provides a summary of how faculty members use it to document curriculum changes over time, describe students' learning development over time, and manage its annual assessment planning activity.	2.50
2.a	The Program lists and describes the evidence (program artifacts, rubrics, certifications, surveys, etc.) and processes utilized to assess program-level competencies and resulting program continuous improvement.	2.74
2.b	Describe the short-cycle process utilized to continuously document Program changes/improvements in student learning over time to support evidence gathering.	2.93
2.c	The Program describes how it evaluates its intentional student engagement in the Program and field using data resources such as CCSSE/SENSE data and others, if applicable.	2.93
2.d	Data-Embedded Area	
3.a	Using the displayed learning assessment plans (imported from Campus Labs planning module), Programs explain how they annually maintain assessment planning, discuss some of the changes made to planning over the review cycle based on data reporting, and provide one example of an improvement that emerged from planning efforts.	2.60
4.a	Using the displayed operational assessment plans (imported from Campus Labs planning module*)*, Programs explain how they annually maintain assessment planning, discuss some of the changes made to planning over the review cycle based on data reporting, and provide one example of an improvement that emerged from planning efforts.	3.19
5.a	Programs summarize their performance on achieving student academic success and provide supporting evidence such as course success rates, fall-to-fall retention rate, completion rates, percent of students proficient at program learning competencies, and others.	2.88
5.b	Data-Embedded Area	
D.	**DISCOVERIES AND ACTION ITEMS FOR ENSURE STUDENTS ARE LEARNING**	
1.a	For the above pillar section, identify achievements made during the review cycle, report efforts for evaluating performance, and describe areas or opportunities for future success. Describe the most impactful opportunity for improvement over the next program assessment cycle and provide rationale for its selection.	3.18
2.a	List the Pathway program's/specific program recommendations for improvement of this pillar performance.	2.75

2.b	Describe how the Pathway program/specific program plans for future success and improvement by developing an action plan(s) based on the above Pathway review self-study discoveries, data, and stakeholder feedback. Explain how the action plan(s) supports future development of annual assessment planning (either learning competencies or operational outcomes). Use the Campus Labs planning module to report the action plan(s). See attached instructions.	2.85
2.c	Provide a timeline for accomplishing action plans that are to be carried out during those years between Pathway review periods.	2.93
	SECTION AVERAGE	**2.86**
VI.	**CONCLUSION**	**Total**
A.	**SWOT ANALYSIS**	
1.a	The Pathway program, and each specific program provides a listing of strengths, weaknesses, opportunities, and threats that emerged as a result of the Pathway Review process including all four Pathway pillars. A SWOT list should be developed for each of the four pillars.	2.99
1.b	Programs describe at least one relationship or alignment existing between SWOT items and their development of action plans.	3.01
	SECTION AVERAGE	**3.00**

Appendix D:

ASC Subcommittee Recommendations for Program Review Cycle, 2020-21

Memorandum

To:	Academic Standards Committee
From:	Dr. Kim Bender, Associate Vice President of Institutional Effectiveness Dr. Erin Nitschke, Academic Program Review Subcommittee Chair
Date:	September 3, 2021
Re:	Subcommittee Recommendations for Program Review Cycle 2020-2021.
cc:	Dr. Schaffer, President

This memo provides the Academic Standards Committee (ASC) with an overview of the Academic Program Review (APR) Subcommittee's findings during the AY 2020-2021 program review cycle. The findings are separated into two sections: subcommittee recommendations and feedback on the program review process.

Section I – Subcommittee Recommendations

The central function of the APR Subcommittee is to engage the program review process, provide feedback for program faculty who prepare self-studies, and make recommendations to the ASC regarding the status of said program reviews. During the AY 2020-2021 program review cycle, the STEM Pathway utilized a new Pathway Review Template, which was developed by the APR Task Force 2020 during spring and summer of 2020. The STEM Pathway includes six programs: a general Pathway program along with the five specific programs of Biology, Biomedical Sciences, Computer Science, Engineering, and Physical Science.

The STEM Pathway, including the six above programs, completed six self-studies, each with three common Pathway sections I, II, and III as well as three program-specific sections IV, V, and VI; four of these sections relate directly to the four Pathway pillars. This 2020-2021 review was designated as a "start -up review" in that it was the initial review of the Pathway process at LCCC. There was little historical evidence available for this Pathway because it included the first year of Pathways implementation at LCCC; the Institutional Research data focused on pre-Pathway, program experiences. The table below outlines the APR Subcommittee recommendations for these six programs.

Acceptance of Program Review with no Contingencies	
STEM Pathway Program	Computer Science Specific Program
Biology Specific Program	Engineering Specific Program
Biomedical Sciences Specific Program	Physical Science Specific Program

This STEM review provided valuable information to the STEM programs as a result of the peer-review feedback provided. It also generated robust guidance to the summer 2021 faculty group that revised the Pathway template for the upcoming 2021-2022 cycle of program review (Trades and Technical Studies). These faculty members met periodically during the summer and made extensive improvements to the

template based on the faculty and peer-reviewer feedback obtained in May 2021 (see Section II – Feedback below).

Section II – Feedback on Program Review Process

After the program review cycle ended in spring 2021, the APR Subcommittee Chair Erin Nitschke scheduled two Zoom meetings that included faculty representing the STEM Pathway programs and members of the ASC Program Review Subcommittee (peer-reviewers). Meeting intent was to gather feedback on the Pathway Review Template used during the program review process; the feedback is provided below.

2020 - 2021 Program Review: Feedback Meeting Notes for Pathway Template Improvement

Monday, May 3, 2021

Attendees:

Program Leads – Trent Morrell, Ami Wangeline, Stephanie Fiedler, Rob Van Cleave, Kelly Humphrey

Peer-Reviewers – Erin Nitschke, Sheridan Hanson, Kristin Abraham, Steve Hrkach, Andrea Clubb, David Curry, Kari Brown-Herbst, Lisa Taylor, Susie LeMaster, Caleb Perriton, Damien Kortum, Marie Yearling, Robert LaFaso

Other Participants – Bryan Wilson, Roberto Munoz, Sarah Smith, Kim Bender, Amanda Newell

Zoom Recordings:

First session - https://lccc-wy.zoom.us/rec/share/lRaEnN91VTZtD2puL_pByVmCXFnEPAzZsNNRX1uRvrKDyh4RCHHeHAp3Kxo5Tu3b.ICOompUZlmPvBy8M?startTime=1620050101000

Second session - https://lccc-wy.zoom.us/rec/share/mJDVjZ35yu3UtyEk5CuL12IbI9ckJT4wsmNVH3wgQ9JcqNTKBlNDi8SKW1aYfjPL.InzQbJDjGLL576ox?startTime=1620075325000

Key Points:

1. **What worked well for you?**

   (Trent) – The ability to work together as a group helps but there is some improvement to be made to lessen redundancy. The data embedded in the self-study template was readily accessible and useful.

   (Kristin) – Programs had higher level of response and ability to provide good data because of the teamwork set up.

   (Kari) – The Pathway section responses were consistent across all six Pathway program which communicated teamwork and created an effective story for the reviewer.

   (Andrea) – Helps Student Life and advisors understand what students might be going through and program priorities.

(Stephanie) – The teamwork was really good and having the Pathway Coordinator organize the work flow and consistency. The timeline worked well. The data was super-useful to be already embedded.

(Sarah) – Appreciate the clarity of where data needed to be embedded in the template.

(Lisa) – The entire process was clear as a reviewer, and the documents helped identify what areas needed examined.

(Roberto) – It was useful to split the work into smaller pieces as it allowed flexibility with time and focus on specific program sections.

(Ami) – Allowing the program to help develop the timeline was a plus.

(Kelly) – The orientation was helpful. The way the IR documents were already uploaded into the template—clearly presented.

2. What should the institution consider modifying or adding?

(Kari) – The vocabulary is confusing at times. Pathway (capital P, meaning one of the 8) Program (capital P) preceded by the Discipline (Engineering Program), and Pathway Program meaning the single "general" program in each Pathway. Clarify the distinction and where specific program area starts.

(Steve) – Some of the verbiage was very vague. Helpful to understand the purpose of program review.

(Trent) – The process is too complicated in terms of redundancy. Some of the sub-guidelines can be combined. There is a lot of going back and forth which is confusing and time consuming. Suggestion to link Sections I-III to be reviewed one-time.
--Information in action plans hidden from the narratives so need to make it visible all in place
--Pathway sections are good idea, but need to simplify complexity. Some guidelines too similar.

(Kristin) – The pillars are helpful but there were times there was an opportunity to comply academics with other services and some of the questions invited answers that cross purposes, yet at the same time, separation invites repetition and redundancy.

(Rob V) – The process is way too long. The result wasn't useful compared to amount of effort. This isn't something I would reference, it is just viewed as an exercise that programs have to go through, but it can be modified to add value.

--Budget cut decisions made using the program analysis. Program review should be directed at getting programs to the upper right quadrant (strengthening the variables in the analysis)

(Sheridan) – It was hard to clarify which information was program specific. Hard to notice the transition point to specific program. (Kim) color code or a prominent Division Heading.

(Kristin) – Reviewers interpret questions differently. Suggestion to add more training to understand what the questions are asking or possibly add more definitions. Practice how to read/interpret the guidelines.

Trent: Agree with review comments, and the difficulty we had with integrating Computer Science with the Pathway was a challenge for us. (Kim see Lawson and SLCI and computer science learning competencies?)

(Ami) – Sections I-III should be one section and reviewed separately since they are Pathway oriented. Sections IV and V are unique to each program within the Pathway. All students in STEM start in a single pool and it doesn't make sense to treat them as separate entities based on where they end up– not valuable information.

IV.A.3 – Needs clarity on goal of section and how information is going to be used.

IV.B.1 – Data in this section is outdated currently. Part of this section is about success of transfer and the other part is about articulation agreements, which there is no data collected for articulation. Need to decide what is being asked and what data needs to be collected OR if this is the data we have, what do we need to interpret from the data.

(Kim) This was brought out in the review comments as well, the lack of useful data from the four-year institutions. Recommended new data such as first semester GPA by program---work with the receiving institution to get that. Work harder at alumni survey response rates to see if articulation worked, whether the courses really prepared them, are competencies really aligned to UW junior level entry.

(Kim) Should communities become more specific for retention purposes? I did not see a study or research on the dynamics of building communities, e.g., building capacity.

V.A.2 – Professional development shouldn't be specifically tied to myPATH goals because those goals are set separate from the program level goals—not personal level goals. (

(Marie) – V.A.1b difficult to distinguish from with V.A.3 (Best Practices in Instruction) with V.A.4.i (Effective Educational Practices: Instructional Methods).

Some guidelines have multiple parts making it hard for the program to write a narrative and the reviewer to rate. The guidelines should be explicit. Example of a guideline that has multiple parts – professional development. (some parts within a part?) Prof. development should align with values or competencies and not with myPATH.

3. Was there any data that you needed that you did not have or were unable to obtain?

(Kari) – Need clear references when things are attached, perhaps a hyperlink embedded in narrative, e.g., curriculum changes for Engineering.

(Trent) – Would be nice if document directory was automatically linked to all Pathway programs. Had to manually align each of the six programs to a directory file. Additionally, any data referenced was not a true representation of the STEM Pathway moving forward. It was a challenge to get scientists to focus on planning how the data will be used in the future.

(Sheridan) - It would be great to have more data about graduate surveys or employer surveys working with IR as the programs get developed, but I don't know if that is easy with STEM especially with the transfer students.

(Ami) – In the future we will want more data, but this cycle is new to the Pathway.

(Marie) – There is a lot of data to digest, especially for the reviewers who are not familiar with the program. Suggestion is to provide "key take homes" for that section. How meaningful is the score if the reviewer doesn't really know how to interpret the data? Suggestion for IR to help programs interpret their data to identify changes and the areas to highlight in their narrative.
(Kim) Identify big swings in data for programs to speak to.

(Kim) no need for reviewers to be data experts, but must see the data that is available to the programs for context and to learn if programs discuss the data in the narratives.

Should we include an Academic Standards common data set into a future review? 3 separate data pots—KPIs / VFA data / program analysis.

(Trent) - Providing the dashboard screenshots is helpful and maybe we can just do that as a first look.

4. **How did the process go for you as a program lead OR as a reviewer?**

(Dave) – The process has gotten better since last time program was reviewed, but there is a lot of room for improvement. What do we need out of this process? How can we clearly meet those goals? What are the goals of the institution? How are we going to take this information and make our students better?

(Ami) - Broad lens of simplification – We get so bogged down on the language and the examples that it is difficult for the program to think about what is relevant and what they are excited about.

Vary the perspective of the pathway review as Team oriented v. specific program oriented HSW

5. **How might we improve the process to make APR more relevant and useful to you and your respective programs?**

(Sheridan) – I worry about the consistency with the review team. Having a new team all the time maybe does not serve the review as it should. Can we make this a 3-year commitment for the review team to establish some consistency and expertise with each cycle?

(Stephanie) – Would it make sense to ask for AN example of a success and AN example of an area to improve? I struggled with areas that said to provide achievements. Do you really want ALL of our achievements over the last 5 years? Maybe we could just give you ONE that we feeling really proud of. And ONE area that we really want to focus on to improve.

(Marie) – Focus on what are the most important things for a program to be successful and what data can we use to identify those areas – create a roadmap for faculty to help them identify what they should be working on. Provide a clear focus for improvement. What do the best programs do?

6. **Additional comments**

(Sarah) – Knowing what instructors would like to get out of the process would be helpful to identify useful data.

(Rob) – What is the value of having a scoring system? This type of quantitative analysis turns the review process into a competition. Additionally, the scores are not consistent between reviewers – specifically Sections I-III.

Post-Meeting Notes

Sam Graham provided some additional feedback. He described the review process as "necessary" but "overwhelming." He views the process as a "word game" meaning those who write well get the higher scores. His additional comments echoed others in regards to redundancy and confusion.

Other Related Topics

ASC Program Review Subcommittee and the development of a common data set and a dashboard

Should monitoring of Pathway performance diagnostics (measures) monitoring be done by Deans. IR can help with training. Sarah can provide some overall observations, but Deans should be able to read the data, especially in a common dashboard resource. If Sarah provides too much, then programs will think that is all they need to do. The question HOW DO WE KNOW WHAT TO WORK ON? Regular monitoring of the diagnostics and continuous improvement using diverse annual assessment processes.

End of Feedback