

STEM Pathway Program Review Summary

DECEMBER 1, 2021



LARAMIE COUNTY COMMUNITY COLLEGE

Science, Technology, Engineering & Math Pathway



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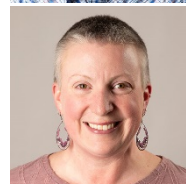
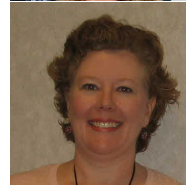
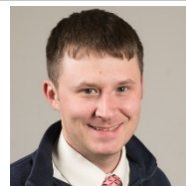
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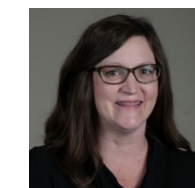
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**Retired or no longer with the college*





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**Retired or no longer with the college*





STEM Pathway Support Staff



- Maggie Swanger
 - STEM Librarian/Geology Instructor



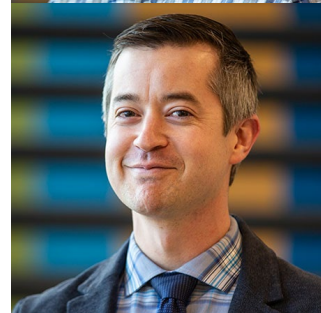
- Amber Holen
 - STEM Foundation Representative



- Amy Brumfield
 - STEM Academic Advisor



- Jesse Brumfield
 - STEM Academic Advisor



- Adam Keizer
 - Coordinator, Career Services





Administrative Support



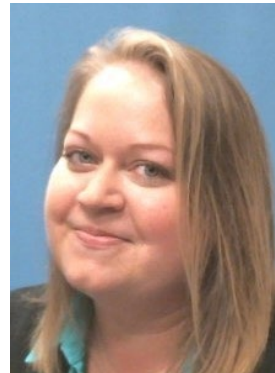
■ **Dr. Joe Schaffer**, President



■ **Dr. Kim Bender**, Associate Vice President, Institutional Effectiveness



■ **Dr. Kari Brown-Herbst**, Vice President of Academic Affairs



■ **Janet Webb**, Assistant Dean, Academic Affairs





STEM Pathway Program Advisory Committee

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What is (are) Pathways?

“The Pathways Model is an integrated, institution-wide approach to student success based on intentionally designed, clear, coherent and structured educational experiences, informed by available evidence, that guide each student effectively and efficiently from her/his point of entry through to attainment of high quality post-secondary credentials and careers with value in the labor market.”



-LCCC Pathways Model, <http://lccc.wy.edu/guidedPathways/>

“LCCC is focused on providing clear, coherent pathways for students, ones that lead them to meaningful opportunities when they graduate. . . , hopefully right here in Wyoming.”

-President, Dr. Joe Schaffer





STEM Pathway

Students in the STEM pathway research people, animals, machines, buildings and the universe as they learn about emerging technologies and prepare for continued education in their career paths.

- Includes the traditional, math, technology, and science-based courses
 - Anatomy
 - Astronomy
 - Biology
 - Chemistry
 - Computer Science
 - Engineering Science
 - Geosciences
 - Mathematics
 - Microbiology
 - Physics
 - Physiology
 - Statistics





STEM Pathway

- Merged departments into a cohesive, and synergistic unit – Pathway
 - Maintain specific programs
 - Added option for a “general” degree in STEM*
 - Biology A.S.
 - Biomedical Sciences A.S.
 - Computer Science A.S.
 - Engineering Science A.S.
 - Physical Science A.S.
 - Chemistry
 - *Physics (modification in process)*
 - Geoscience
- ***STEM A.S.**
 - can be tailored to suit a student’s interest in a STEM-related field





STEM Pathway Program Review

- October 2020 – February 2021
 - Self-study Template
 - Worked in teams per degree
 - Common goals and strategies throughout Pathway programs as a whole
 - Based on 4 Pathway Pillars to student success:
 - I. Help Students Choose and Enter a Pathway**
 - II. Help Students Stay on Their Path**
 - III. Clarify Paths to Student End Goals**
 - IV. Ensure That Students Are Learning**





STEM Pathway 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:
 - acquire knowledge and skills necessary to STEM fields and
 - become informed, critically thinking and engaged citizens
 - acquire the specific knowledge and skills within chosen field to:
 - a. Become successful professionals
 - b. Transfer to a four-year institution





STEM Pathway Leadership Team (PLT)

- **Pathway Coordinator**
- **School Dean**
- **Academic Advisors**

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.

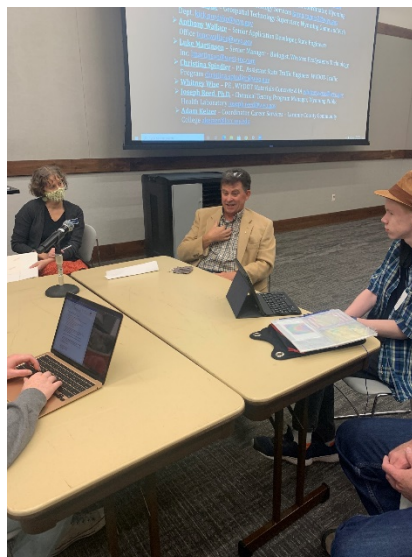


Strategies for Success (STRT 1000)



- Freshman (new student) seminar class
- Focus on how to be a successful student, but also in life and future career
- Entrepreneurial mindset concepts (STEM context)
- Career exploration

Stem Professional Interview sessions





STEM Pathway

- Regardless of program or interest, all STEM Pathway students begin with a common first semester

First Semester Course Requirements

- **STRT 1000** - Strategies for Success Credits: 3 | CAC
- **MATH 1400** - College Algebra Credits: 3 or higher (Credits: 3-4) | CAC
- **CHEM 1020** - General Chemistry I Credits: 4 | CAC

Choose One:

- **COSC 1010** - Introduction to Computer Science Credits: 4 | CAC
OR
- **ES 1060** - Intro to Engineering Computing Credits: 3 | CAC
OR
- **BIOL 1010** - General Biology Credits: 4 | CAC





Biology A.S.

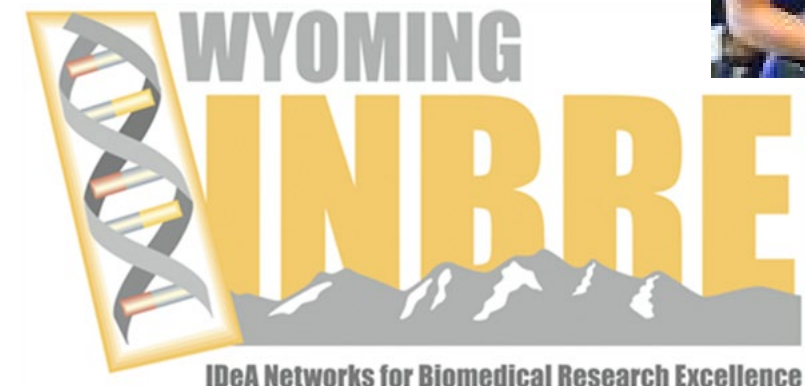
- Prepares students for careers in the fields of life science
 - Biochemistry
 - Biology
 - Botany
 - Conservation
 - Ecology
 - Forestry
 - Human Medicine
 - Microbiology
 - Molecular Biology
 - Wildlife
 - Zoology





Biomedical Sciences A.S.

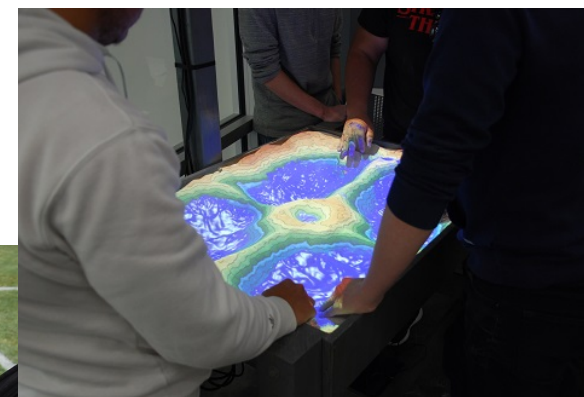
- Designed for students who wish to improve the lives and health of their community by serving as a doctor of medicine, veterinary, pharmacy or dentistry.
- Students who complete this program achieve an Associate of Science degree with the necessary course work to apply to a four-year university or medical-related professional school.
- Students have the opportunity to explore a range of medical professional fields and can participate in disease-centered biomedical research.





Physical Science A.S.

- Students have the opportunity to explore a range of physical science fields and can participate in research.
- Prepares students for transfer to a four-year university in disciplines such as:
 - Chemistry
 - Physics
 - Geosciences





Science Program Competencies

- 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.





Computer Science A.S.

- Provides a foundation for students to complete their bachelor's degree at a four-year institution in the many specialized concentrations of computer science.
- Graduates often work in large and small private companies as well as government agencies as:
 - Computer Programmers
 - Web Developers
 - Database Administrators
 - Software Developers
 - Geospatial Technology Professionals
 - Computer Scientists





Computer Science Program Competencies

- 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 Science A.S.

- The field of engineering uses scientific processes for designing and building machines, vehicles, structures, bridges, roads and more.
- Students start with general, transferable courses focused in mathematics and engineering science that will allow them to specialize later. Students work hands-on in laboratory settings as well as with scientific and engineering software.
- Program has been re-designed
- Offered fully online through Albany County Campus





Engineering Program Competencies

- 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.





Engineering Science A.S.

Fall 1 (1st)

STRT 1000: Strategies for Success

MATH 1400: College Algebra or elective if beginning with MATH 2200 (Recommend Business Elective or GEOL 1100 if planning for Petroleum Eng.)

CHEM 1020: General Chemistry I

ES 1060: Intro to Engineering

Spring 1 (2nd)

HSI Credit--US & WY Constitution

ENGL 1010: English Composition & Rhetoric

MATH 1405: Trigonometry or elective if beginning with MATH 2200 (Recommend CHEM 1030 or GEOL 1100 if planning for Petroleum Eng.)

BIOL 1010: General Biology

CE Credit (ART 1000 and MUSC 1000 are the only LCCC Creative Expression choices that align with UW USP HC Credits)

Summer 1 (3rd, Required)

MATH 2200: Calculus I

Fall 2 (4th)

ES 2110: Statics

MATH 2205: Calculus II

COMM 2010: Public Speaking

HC Credit--ANTH 1200---We may change this to add options, GEOG 1000 or ECON 1000, UW doesn't specify a certain H credit.

ES 2210: Electric Circuit Analysis

Spring 2 (5th)

ES 2410: Mechanics of Materials

MATH 2210: Calculus III

PHYS 1320: College Physics II

ES 2120: Dynamics

Summer 2 (6th, Optional) We plan to send students to UW the summer after graduation to take these courses.

ES 2330: Thermodynamics (can take at LCCC or UW in the summer)

ES 2310: Fluid Dynamics (can take at LCCC or UW in the summer)





Engineering Science A.S.

NOTES:

Courses highlighted in GREEN are Gen Eds that are normally taken JR/SR Year at UW in PETE and Civil

UW can provide substitutions or optional planning to keep students on track for the following courses: CE 1000, CE 1010, CE 2000, CE 2070, CE 3200, ATSC 2100, PETE 1060, PETE 2050

Summer Semester UW Offers ES 2330 and ES 2310 on 2 separate 8 week blocks

Discussed Adjustments and Notes for PETE students:

PETE 2050 can be taken Summer semester at UW with ES 2330. UW Advising will adjust planning for ES 2310 to be taken the following Fall semester. PETE 3015, will then be moved to the following Spring after Transfer.

Students can choose to take GEOL 1100 if they plan to matriculate to BS-PETE or Civil?

Civil and PETE students graduating from LCCC in our AS-Engineering Science program will end up with only one extra course: ES 2210, however this will give them the option of changing programs without needing to make it up.

ES 2210 replaced the CE credit in the Fall 2 semester and CE credit was moved to the Spring 1 semester.





STEM A.S.

- 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.
- Can be tailored to the interest of the student beyond a specific program that is offered*
 - Mathematics
 - Environmental Science
 - Geospatial Technology
 - Meteorology
 - Architecture



**Transfer agreements and articulations being developed*





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





STEM Pathway Measurable Achievements

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.

EARLY OUTCOMES

- Number of college credits earned in first term
- Number of college credits earned in first year
- Completion of gateway math and English courses in the student's first year
- Number of college credits earned in the program of study in first year
- Persistence from term 1 to term 2
- Rates of college-level course completion in students' first academic year
- Equity in outcomes

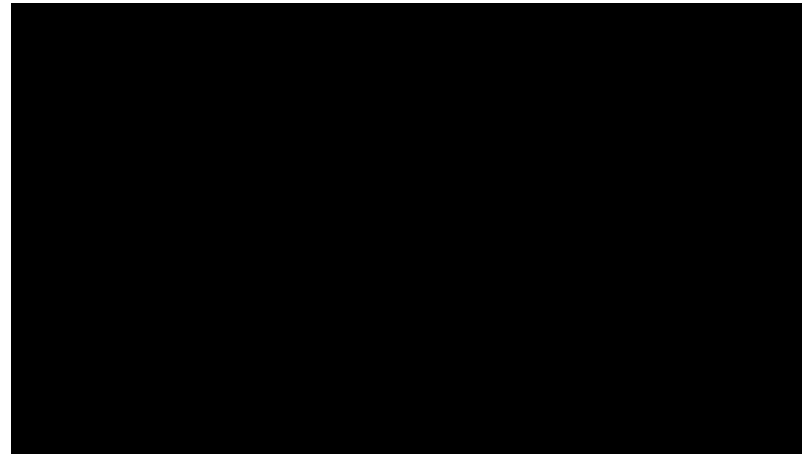


STEM Pathway Measurable Achievements



- Multiple faculty and staff awards
- Involved in numerous community events
- Over 20 grants funded
- Dozens of published research articles, including undergraduate research projects

- 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.

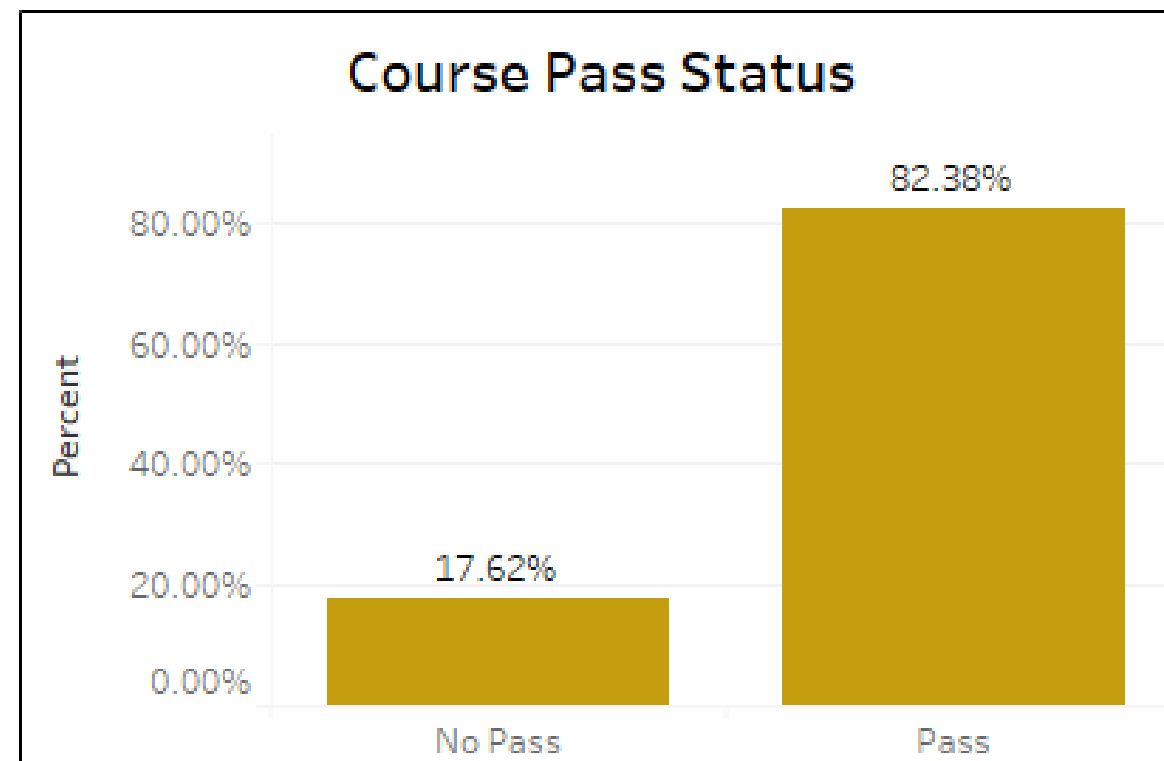
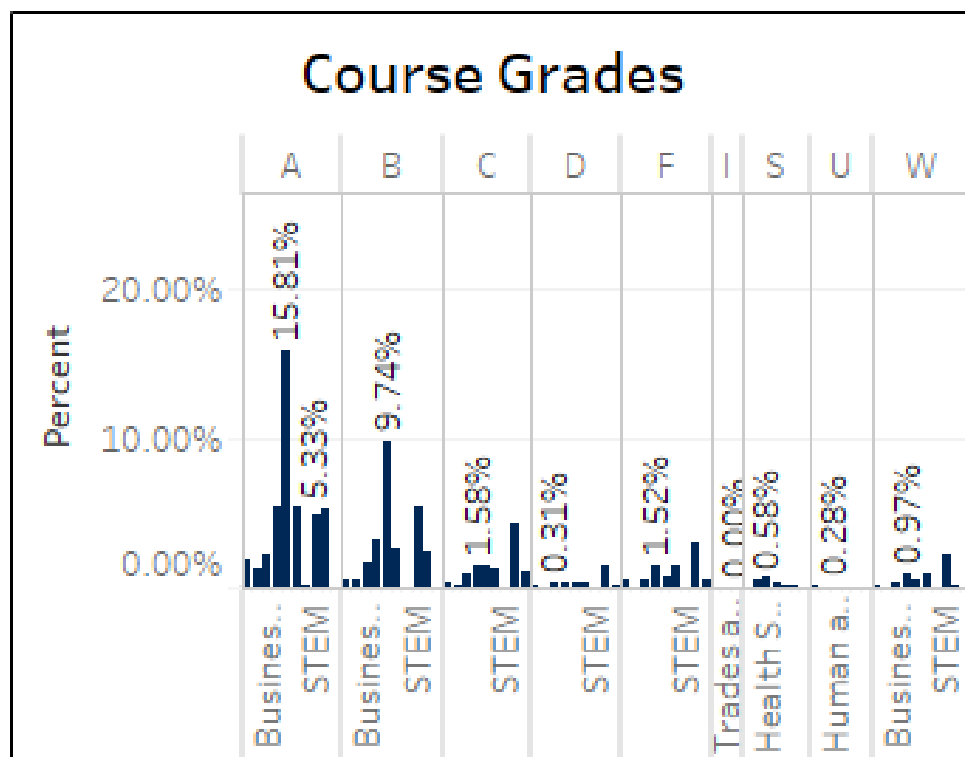




STEM Pathway Measurable Achievements



Grade Distributions Fall 2015 through Summer 2020





STEM Pathway Faculty to Student Relationships



- Active learning classroom settings. . . common practice throughout the entire STEM Pathway.
- Faculty learn students' names, personalities and interests within the first week of classes in order to personalize their interactions with the class and during individual encounters.
- Science lab courses are limited to 20 or fewer students to facilitate relationship building in the class. Multiple sections of labs may be offered to accommodate this type of setting. . .



STEM Pathway Faculty to Student Relationships



- Faculty are available to students at all times, not just during scheduled office hours.
- Offering of and participation in Student Clubs and Organizations:
 - Natural Science/Biology Club
 - STEM Club (coming soon)
 - BioBlitz
 - Orienteering and Snowshoe Adventures
 - Geology of Yellowstone Trip





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.





Help Students Stay on Their Path

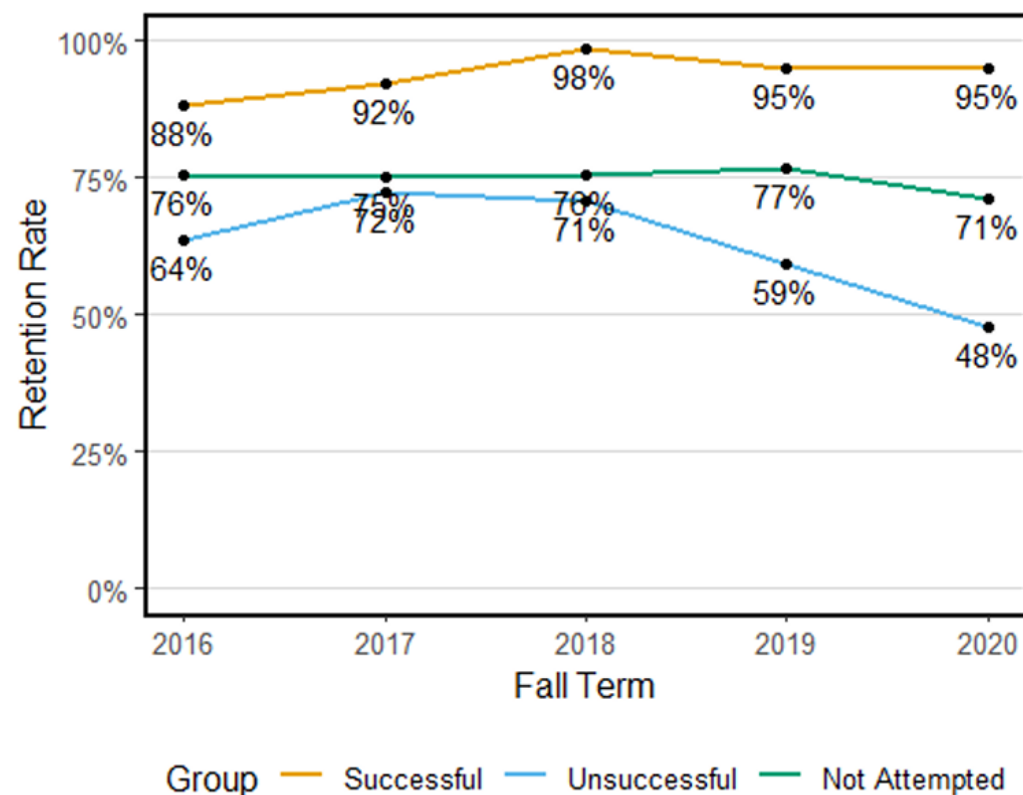
- **Description of Action Plan Goal:** Bolster persistence within the STEM Pathway by focusing efforts to assist students in the completion of a college-level Math during their first, no later than second, semester at LCCC. Increase success rates for college-level Math by 15%-20%.



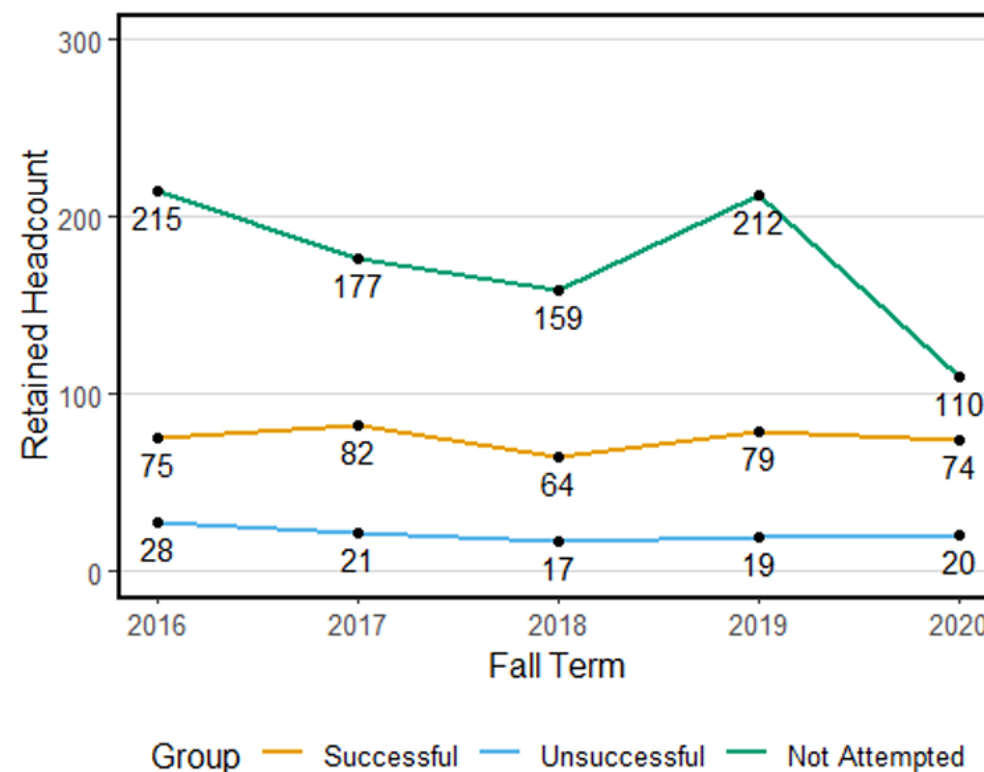


Help Students Stay on Their Path

Fall-to-Spring Retention Proportions



Fall-to-Spring Retention Raw Numbers





Clarify Paths to Student End Goals

- **Description of Action Plan Goal:** The STEM Pathway, as a collective program, shall increase graduation rates by 20%.

	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	3	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%





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.





Ensure That Students are Learning

- **Science Literacy Concept Inventory (SLCI)** results provide faculty with information about students' grasp of science literacy.
- **Lawson Classroom Test for Scientific Reasoning (LCTSR)** is a popular assessment tool for evaluating students' scientific reasoning skills.





Open Discussion and Questions



Laramie County Community College
STEM PATHWAY





THANK YOU!!

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