

# Supplemental Material

*CBE—Life Sciences Education*

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Supplemental Material

		<b>Criteria for stating goal</b>	<b>Criteria for stating that goal was measured and for determining whether a program was successful or unsuccessful in meeting the goal</b>
<b>Academic</b>	<b>Remediation</b>	Remediation is considered to be a goal of a program if it is stated in a program’s report that the program aims to remediate students so that they can place into a non-developmental or higher-level course at the start of the regular academic term. If a report phrased this in similar ways, such as “giving students the chance to start college ‘on-track,’” regarding a specific course or course sequence, then this is also considered to be a goal of the program.	<p>The goal of remediation is considered to be measured if the program reported how many students were remediated by the program regarding the relevant courses. Student self-report of remediation is not considered a measurement of this goal.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Improve content knowledge</b>	<p>Improving content knowledge is considered to be a goal of a program if it is stated in a program’s report that the program aims to provide students with content knowledge or academic skills specific to the classes that students will need to take as part of their selected major, or if the program aims to increase students’ academic achievement specifically by providing the students with major specific content knowledge (as opposed to giving them note-taking skills or other soft skills).</p> <p>We did not consider more general goal statements such as “increasing foundational knowledge,” as meeting the criteria for having this goal. Additionally, if it is reported in a paper broadly that students will be taking course work relevant to the students’ major, we did not consider this to be a goal of the program, as this type of preparation could be targeting other constructs such as students’ ability to adapt to the pace of a college course.</p>	<p>The goal of improving content knowledge is considered to be measured if students’ performance on a content-specific exam was reported. Neither student self-reported gains in content knowledge nor the measuring of GPA are considered as measurements of this goal.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>

	<b>Maximize GPA</b>	<p>Maximizing student GPA is considered to be a goal of a program if a program's report stated that the program aims to increase student GPA or grades. It was also considered to be a goal if it was stated that the bridge program addresses a problem of low GPAs of bridge participants. This is also considered to be a goal if it is reported that a goal of the program is to increase success within a specific course (e.g. increase number of passing grades in a course).</p>	<p>The goal of maximizing student GPA is considered to be measured if students' GPA or grades were measured by the researchers at any time following student participation in the bridge program. Student self-report of increased content knowledge is not considered to be a measurement of this goal.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Increase research participation</b>	<p>Increasing student participation in research is considered to be a goal of a program if a program's report states that the program aims to increase bridge students' participation in research.</p> <p>A program is not considered to have this goal if authors reported having other goals pertaining to research such as research excitement or research self-efficacy.</p>	<p>The goal of increasing student participation in research is considered to be measured if students' rates of participation in research were measured in anyway following participation in the program. Students' self-report of research participation is not considered to be a measurement of this goal.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Increase retention</b>	<p>Increasing student retention is considered to be a goal of a program if a program's report states that the program aims to increase participating students' retention in STEM or in college broadly. This was also considered to be a goal of a program if it was reported that the program aims to decrease the number of students who are leaving the major or college, or if it was stated that the bridge program addresses a problem of lower participant retention. If a paper used the phrasing of 'persistence' rather than retention, then this is still considered to be a goal of the program.</p> <p>While many programs discuss retention being a problem at the national level, we did not consider this to be a goal of a</p>	<p>The goal of increasing student retention is considered to be measured if student retention was measured at any point (e.g. from semester to semester or from year to year). Students' self-reports of their retention or the measuring of graduation rates is not considered to be a measurement of this goal. The measurements do not have to be specific to STEM.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>

		program unless it was more explicitly stated (e.g. “This bridge program set out to address this retention problem”).	
	<b>Increase graduation rates</b>	Increasing graduation rates is considered to be a goal of a program if it is stated among the program's papers that the program aims to increase the number of students who graduate/finish college or STEM/the major specifically. This was also considered to be a goal if it was stated that the bridge program is addressing a problem of lower participant graduation rates.	<p>The goal of increasing graduation rates is considered to be measured if participating students’ graduation rates were measured. Students’ self-reports of their graduation is not considered to be a measurement of this goal. This does not have to be specific to STEM.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
<b>Psychosocial</b>	<b>Increase interest in the major</b>	Increasing student interest in the major is considered to be a goal of a program if it is stated in a program’s report that the program aims to enhance students' interest or excitement in STEM or in a specific STEM major.	<p>The goal of increasing student interest in the major is considered to be measured if the paper reported out students’ responses to a survey about their interest in STEM or a specific STEM major, or if in an interview study students were asked about their level of interest/passion/excitement, or if in an interview study themes of students’ interest in the major emerged from the data.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Sense of belonging</b>	Enhancing student sense of belonging is considered to be a goal of a program if it is stated in a program’s report that the program aims to create, provide, or enhance sense of belonging or sense of community in college or within STEM for the programs' participants.	<p>The goal of enhancing student sense of belonging is considered to be measured if the paper reported out students’ responses to a survey about their sense of belonging or sense of community in college, within STEM, within their major, or within the bridge program. Alternatively, the goal is also considered to be measured if, in an interview study, students were asked about their sense of belonging, or if in an interview study themes of students’ sense of belonging arose from the data.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that</p>

			implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.
	<b>Sense of preparedness</b>	<p>Enhancing student sense of preparedness is considered to be a goal of a program if it is stated in a program's report that the program aims to enhance students' sense of preparedness with regard to STEM broadly, in the major, or in research.</p> <p>This is not considered to be a goal of a program if it is reported in program reports that the program broadly aims to prepare students. This goal specifically requires enhancing a 'sense' or 'feeling' of preparedness.</p>	<p>The goal of enhancing student sense of preparedness is considered to be measured if the paper reported out students' responses to a survey regarding their sense of preparedness with regard to STEM broadly, in the major, or in research. This was also considered to be measured if in an interview study students were asked about their sense of preparedness, or if themes of students' sense of preparedness arose from interview data.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Self-efficacy</b>	<p>Improving student self-efficacy is considered to be a goal of a program if it is stated in a program's report that the program aims to enhance participating students' levels of self-efficacy, confidence or belief in their ability. Specifically, we report goals of self-efficacy, confidence or belief in personal ability with regard to STEM research, STEM fields broadly, the major, or specific skills such as math or writing.</p> <p>If a program reports integrating psychosocial components broadly into their program and then mentions measuring self-efficacy, we do not consider this to be a goal unless it was more explicitly stated (e.g. "this program set out to increase students' math confidence").</p>	<p>Improving student self-efficacy is considered to be measured if the program reports out students' responses to a survey regarding their self-efficacy/confidence, or if in an interview study students were asked about their self-efficacy/confidence, or if themes of students' self-efficacy/confidence arose from the interview data. Students responding to questions about their perceived ability to succeed is also included here.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Networking with students</b>	<p>Networking with students is considered to be a goal of a program if a program's report states that the program aims to provide the program's participants with opportunities for or development of social interaction, networking, relationships, mentorship from peers or from other students, including graduate students.</p>	<p>Networking is considered to be measured if the paper reported out students' responses to a survey about their networking with students. In an interview study networking is considered to be measured if students were asked about their networking with students, or if themes of students' networking with other students arose from the data.</p>

			<p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Networking with faculty</b>	<p>Networking with faculty is considered to be a goal of a program if a program's report states that the program aims to provide participants with opportunities for social interaction, networking, building relationships, mentorship with faculty and instructors. If the report refers to building relationships or networking with graduate students it is not considered as networking with faculty.</p>	<p>Networking with faculty is considered to be measured if the paper reported out students' responses to a survey regarding their networking with faculty. We consider networking with faculty to be measured in an interview study if students were asked about their networking with faculty during an interview, or if study themes of students networking with faculty arose from the data.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
<b>Department-level</b>	<b>Recruit students to the major</b>	<p>Recruiting students to the major is considered to be a goal of a program if it is stated in a program's report that the program aims to attract students into a STEM field, advertise a major, or if it is stated in the report that the bridge program was implemented to increase enrollment in STEM or a particular STEM major.</p> <p>Recruiting students to a major is not considered to be a goal if the program states the above but only recruits students from an underrepresented population. If this is the case, then we interpret this information as enhancing the diversity of the major to be the goal of the program.</p>	<p>Recruiting students to the major is considered to be measured if the authors of the report provide the number of students the program has attracted into STEM or a specific STEM major at that institution.</p> <p>A program that measured this goal is marked unsuccessful for meeting this goal if the authors interpreted their data in a way that implied that they were unsuccessful in meeting this goal. Otherwise, the program goal is marked as successful in meeting this goal.</p>
	<b>Enhance diversity of the major</b>	<p>Enhancing diversity of the major is considered to be a goal of a program if it is stated in a program's report that the program aims to recruit or increase representation or enrollment of certain underrepresented groups (e.g. URM students or women) in STEM fields.</p>	<p>Enhancing diversity of the major was considered to be measured if it was reported out the number or proportion of underrepresented students the program has brought into STEM or a specific STEM major at that institution. Furthermore, in order to consider this a goal, the authors had to report these data specifically citing that measuring the possible enhancing of diversity was their reason for collecting and reporting these data.</p>

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**Supplemental Table 1.** Rubric for coding bridge program reports for program goals and goal assessment. This rubric includes the criteria for coding whether a program stated a particular goal, as well as the criteria for stating whether the goal was measured and whether a program was successful or unsuccessful in meeting the goal. Only published reports were reviewed for the presence of bridge program goals. We did not review program websites for goals.

<b>Program</b>	<b>Length</b>	<b>Follow-up</b>	<b>Webpage</b>
Bowling Green State University - Academic Investment in Math and Science (AIMS) Summer Bridge Program	5 weeks	Multiple social and academic gatherings throughout students' undergraduate career.	<a href="https://www.bgsu.edu/aims.html">https://www.bgsu.edu/aims.html</a>
Claremont Colleges - Summer Science Immersion Program (SScIP)	1 week	-	<a href="http://www.kecksci.claremont.edu/News/ssip.asp">http://www.kecksci.claremont.edu/News/ssip.asp</a>
Kapiolani Community College (KCC) - School of Ocean and Earth Science and Technology (SOEST) Summer Bridge: HaKilo	1 week	-	<a href="http://stem.kapiolani.hawaii.edu/the-summer-bridge-program/">http://stem.kapiolani.hawaii.edu/the-summer-bridge-program/</a>
Louisiana State University (LSU) - Biology Intensive Orientation for Students (BIOS) Program	5 days	Students are placed into similar block schedules to maximize their time with one another during the semester.	<a href="http://www.lsu.edu/science/bios/">http://www.lsu.edu/science/bios/</a>
Massachusetts Institute of Technology - Discover Engineering	4-5 days	-	<a href="http://uaap.mit.edu/first-year-mit/orientation/freshman-pre-orientation-programs-fpops">http://uaap.mit.edu/first-year-mit/orientation/freshman-pre-orientation-programs-fpops</a>
Middle Tennessee State University - Pre-college summer bridge program	10 days	Multiple social and academic gatherings throughout students' undergraduate career.	<a href="http://www.tnstate.edu/tlsamp3/bridge.aspx">http://www.tnstate.edu/tlsamp3/bridge.aspx</a>
Monmouth College - Summer opportunities for Intellectual Activities (SOFiA) program	3 weeks	-	<a href="https://ou.monmouthcollege.edu/academics/research.aspx">https://ou.monmouthcollege.edu/academics/research.aspx</a>
Ohio State University - National Science Foundation Science and Engineering Talent Expansion Program (OSTEP) and Pre-Freshman and Co-operative Education (PREFACE) program	6 weeks	-	<a href="https://mep.engineering.osu.edu/preface-summer-bridge-program">https://mep.engineering.osu.edu/preface-summer-bridge-program</a>
Saint Benedict and Saint John's University - Future Chemists Scholarships and Support (FoCuS) Program	7 weeks	Students participate in cohort only courses and social activities.	<a href="http://www.csbsju.edu/admission/finaid/scholarships/focus">http://www.csbsju.edu/admission/finaid/scholarships/focus</a>
Syracuse University - Summer Bridge Program	6 weeks	-	No webpage found
University of Alabama - Engineering Math Advancement Program (E-MAP)	5 weeks	-	No webpage found
University of California Santa Barbara - Expanding Pathways in Science, Engineering, and Mathematics (EPSEM)	2 weeks	-	No active webpage found Last known link: <a href="http://epsem.ucsb.edu">epsem.ucsb.edu</a>



University of Cincinnati - Leadership 2.0 program	6 weeks	-	<a href="http://nursing.uc.edu/academic_programs/bsn/leadership/leadership-bridge.html">http://nursing.uc.edu/academic_programs/bsn/leadership/leadership-bridge.html</a>
University of Maryland Baltimore County (UMBC) - Meyerhoff Scholars Program	6 weeks	Multiple social and academic gatherings throughout students' undergraduate career.	<a href="http://meyerhoff.umbc.edu/">http://meyerhoff.umbc.edu/</a>
University of Memphis - STEM Talent Expansion Program (STEP) Summer Mathematics Bridge Bootcamp	2 weeks	Multiple social and academic gatherings throughout students' undergraduate career.	<a href="http://www.memphis.edu/memphistem/">http://www.memphis.edu/memphistem/</a>
University of Wisconsin Milwaukee - College of Engineering and Science (CEAS) Summer Bridge Program	4 weeks	-	<a href="https://uwm.edu/engineering/ceas-summer-bridge-program/">https://uwm.edu/engineering/ceas-summer-bridge-program/</a>
Arizona State University (ASU) - Women in Applied Sciences and Engineering (WISE)	5 days	Meetings are held once per month during the semester so that WISE participants can network with local professional engineers.	<a href="http://www.public.asu.edu/~aqrmi/wise/">http://www.public.asu.edu/~aqrmi/wise/</a>
ASU - Minority Engineering Program (MEP) Summer Bridge Program	10 days	All bridge participants are required to take the MEP academic success seminar during the following semester.	No webpage found
Morgan State University - The Alliance for Minority Participation Math Bridge Program and The National Aeronautics and Space Administration Morgan Engineering Enrichment Program	4 weeks	-	No webpage found
Pennsylvania State University - Pre-First Year Engineering & Science Program (PREF) program	6 weeks	Multiple social and academic gatherings throughout students' undergraduate career.	<a href="https://www.engr.psu.edu/mep/PREF.html">https://www.engr.psu.edu/mep/PREF.html</a>
Purdue University - Mathematics Summer Bridge Program	1 week	-	No webpage found
Saint Edward's University - The Community for Achievement in Science, Academics and Research (CASAR)	1 week	All bridge students live in the same residence hall during their first year, and take a bridge-only seminar during their first-year fall and spring semesters.	No webpage found
Southern Illinois University Carbondale - Success week	3 days	-	No webpage found
Texas A&M - Personalized Precalculus Program (PPP)	3 weeks	-	<a href="http://ppp.tamu.edu/">http://ppp.tamu.edu/</a>
University of Florida - Engineering Freshman Transition Program (EFTP)	6 weeks	Bridge participants are assigned a peer mentor with whom weekly meetings are held throughout the academic year. Social events are held for the students in both the fall and spring.	<a href="https://www.eng.ufl.edu/students/students/star-office/freshmen-engineering-summer-bridge-programs/">https://www.eng.ufl.edu/students/students/star-office/freshmen-engineering-summer-bridge-programs/</a>

University of Missouri Saint Louis and Washington University - McDonnell Douglas Access to Engineering	8 weeks	-	No webpage found
University of New Mexico - Summer Bridge Program	4 weeks	-	No webpage found
University of North Carolina at Charlotte - Engineering Boot Camp	No set length	Optional enrollment into an additional academic program which takes place during the regular semester is offered to bridge participants.	<a href="http://engr.uncc.edu/current-students/engretgr-1201/engineering-pre-requisite-program">http://engr.uncc.edu/current-students/engretgr-1201/engineering-pre-requisite-program</a>
University of Portland Summer bridge	6 weeks	-	No webpage found
Wayne State University - Summer Bridge Program	8 weeks	-	<a href="http://www.apex.wayne.edu/summer_bridge.php">http://www.apex.wayne.edu/summer_bridge.php</a>

**Supplemental Table 2.** Of the 30 bridge programs that target STEM students, the length of the programs is highly variable, ranging from 3 days to 8 weeks. Twelve programs (40%) have a form of additional follow-up for their participants during the regular academic term. Some programs have extensive social and academic follow-up throughout participants' entire undergraduate career, while other bridge programs place participants into academic cohorts during only the first semester. We identified active webpages for 19 of the 30 bridge programs.