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Developmental Evaluation of Bass Connections

PHASE TWO REPORT: ACADEMIC YEAR 2014-2015

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Acknowledgements & Contact Information

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Phase Two Report
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Executive Summary

Bass Connections was launched in January 2013 as a university-wide initiative funded by a $50 million gift from Anne and Robert Bass to provide students with greater exposure to inquiry across the disciplines, partnerships with unlikely fellow thinkers, sustained mentorship in teams, and the chance to experience the intersections of the academy and the broader world. Since fall 2013, students have been pursuing problem-focused educational pathways and have participated in interdisciplinary project teams in five thematic areas: Brain & Society; Education & Human Development; Energy; Global Health; and Information, Society & Culture.

Seeking a systematic approach to inform the endeavor, Bass Connections administrators and evaluators adopted a developmental evaluation framework that was best suited to the innovative nature and the early stages of the initiative. Phase One of the evaluation, which was designed primarily to describe teams and their functioning, relied on survey data from team members collected in the spring of 2014. Findings reflected widespread positive experiences but also insufficient resources, unclear goals, and high time demands that troubled some project team leaders. Elements of successful teams highlighted the importance of student preparation, expectations, team structure, and interpersonal relationships.

This report summarizes findings from Phase Two of the developmental evaluation, which aimed to build on the Phase One findings by delving deeper into team structure and process and exploring issues related to initiative sustainability. The following themes emerged from qualitative and quantitative analysis of data from surveys, observations, focus groups, and interviews.

1. Students and team leaders reflected positively on their team experience.
2. Most project teams incorporated the three fundamental elements of Bass Connections.
3. Both students and team leaders need a balance of freedom and structure to make the most of their team experience.
4. Collaborative teamwork is central to positive team dynamics and overall team satisfaction.
5. Graduate student and postdoc involvement is mutually beneficial.
6. Structural changes could enhance sustainability.

In keeping with the developmental evaluation framework, Phase Two findings help to hone the Bass Connections model, indicating potential pathways to develop the initiative in the coming years and informing future evaluations. Generalizability of the findings is limited by sampling considerations and findings cannot be assumed to apply to every team or individual experience. That said, these findings build substantially on Phase One data: for example, small changes to support teams and team leaders, such as providing more guidance on team structure and function, could enhance team leaders' involvement. In sum, specific elements of teams are consistently associated with good experiences. Bass Connections provides valuable exposure to and engagement in team-based research for student and faculty participants.

Background & Introduction

Bass Connections was launched in January 2013 as a university-wide initiative funded by a $50 million gift from Anne and Robert Bass to provide students with greater exposure to inquiry across the disciplines, partnership with unlikely fellow thinkers, sustained mentorship in teams, and the chance to experience the intersections of the academy and the broader world. Interdisciplinary project teams, which comprise undergraduates, faculty, graduate and professional students, and postdoctoral fellows, are a central feature of Bass Connections. Since fall 2013, teams have been pursuing problem-focused educational pathways and have participated in interdisciplinary project teams in five thematic areas: Brain & Society; Education & Human Development; Energy; Global Health; and Information, Society & Culture.

A group of program stakeholders, the Program Development Group, first convened in early 2014 to design an evaluation to inform Bass Connections as it grew. As the group's name suggests, the evaluation was not designed to be high stakes—to determine whether the program works or not—but rather to reflect on and inform how Bass Connections is defined and implemented. The group also realized that traditional evaluation designs that typically assess program implementation and effectiveness wouldn't work with a program as new, flexible, and innovative as Bass Connections. To meet this challenge, the group adopted a developmental evaluation framework that would grow with the initiative and would integrate the evaluation into program development.

Unlike traditional evaluation approaches, developmental evaluation is designed to help assess innovations as they develop.[1] This approach discerns program status and process and examines how program components are unfolding. Developmental evaluation helps to identify which directions hold promise, which probably ought to be abandoned, and what new approaches could be tried.

Ultimately, developmental evaluation is about rigorous inquiry for emerging programs in the context of change. It is an intentional approach to using data in meaningful ways to inform innovation in progress. The result of a successful developmental evaluation is informed change in what is being evaluated. Given the innovative nature of Bass Connections, specifically the flexibility in how teams operate, developmental evaluation is a well-suited framework to gather systematic data that can help the program mature.

This 2014–15 (Phase Two) report is the second phase of the Bass Connections developmental evaluation that began with the 2013–14 (Phase One) study. Phase One consisted of team surveys administered in the spring of 2014 designed to capture descriptive information about participant experiences, program feedback, and areas needing improvement. Five main observations emerged from Phase One survey data: more than 90% of project team leaders were positive about the experience; Bass Connections effectively changed knowledge, skills, attitudes, and actions among undergraduates and project team leaders; undergraduates gained in-depth experience in research and teamwork; insufficient resources, unclear goals, and high time demands troubled some project team leaders; and, taken together, survey data illustrated elements of successful teams.

The elements of successful teams that were gleaned from the Phase One evaluation were arguably the most useful information to program development. These included student preparation for teamwork;

[1] Gamble, J. A. (2008). *A Developmental Evaluation Primer.* Montreal, Quebec: The J. W. McConnell Family Foundation. Available at http://www.mcconnellfoundation.ca.; see also Quinn Patton, M. (2010). *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use.* New York: Guilford Press.

clear expectations and goals for all team members; shared project work and team-building; and collaborative, interdisciplinary relationships and teamwork.

These findings were released in the Phase One evaluation report that was used for internal program development purposes. Versions of the report were shared with Bass Connections administrators, theme leaders, and student and faculty advisors.

Building on Phase One findings, and continuing within a developmental evaluation framework, Phase Two was designed to deepen knowledge about teams, themes, and issues that surfaced in the earlier results, such as sustainability. Phase Two relied on a mixed-method design that drew on qualitative and quantitative measures to assess team processes, benefits of participation, faculty and student challenges, and impact on student knowledge, skills, and attitudes. Led by researchers and evaluators in the Education and Human Development Incubator in Duke's Social Science Research Institute, the in-depth design was only possible with the support of a full-time postdoctoral fellow, Deborah Grodzicki, who conducted or oversaw all qualitative data collection and analysis.

Phase Two of the evaluation addressed the following questions.

1. How are project teams incorporating the three elements of Bass Connections—team-based problem solving, research, and integration—across disciplines and learner levels?
2. What challenges do students and faculty participating in Bass Connections face, and how might they be addressed?
3. What do successful teams look like and what elements do they share?

Methods

Qualitative and quantitative methods explored project team processes and identified key elements that could be associated with team success. Evaluators collected data from team observations, semi-structured interviews, focus groups, and surveys.

Team observations. Evaluators contacted the team leaders of all 54 Bass Connections teams that were active in the summer and/or fall of 2014 to inquire about their willingness to allow evaluators to observe a team meeting. Nearly half of all teams (25, or 46%) responded and were observed by an evaluator for one team meeting in late 2014 or early 2015. As shown in Table 1, evaluators observed from two (25%) to nine (64%) teams within each theme.

During observations, evaluators attempted to blend in, maintain distance, and give space for the participants to act naturally and discuss their thoughts without concern of judgment from an outsider. Observers took detailed notes to capture the dialogue and contextual setting.

Semi-structured interviews. Evaluators used a stratified random sampling technique to select a representative sample of team leaders across themes and to provide a layer anonymity (the identity of the selected teams was kept confidential). Evaluators selected 30% of teams within each theme, resulting in a total sample of 15 teams with 3 to 4 teams from each of the five themes. An evaluator contacted one team leader from each selected team for an in-person interview.[2] Team leader interviews were semi-structured (i.e., interviewers followed an established protocol and also probed for additional detail or new directions based on the interviewee's responses) and each lasted approximately one hour.

[2] Evaluators also randomly selected then interviewed five former team leaders.

Team leader interviews included questions on team process, structure, and sustainability. All 15 of the team leaders who were invited for interviews participated, for a response rate of 100%.

Table 1. Nearly half of project teams were observed by an evaluator.

Theme (Total Number of Teams in Each Theme)	Number of Teams Observed	Percent of Teams Observed within Theme
Brain and Society (11)	7	64%
Education and Human Development (15)	9	64%
Energy (9)	3	33%
Global Health (12)	4	33%
Information, Society and Culture (9)	2	25%
Total Count of Teams Observed	**25**	**46%**

Note: Although there were 54 teams in the entire sample, the number of teams within themes totals 56 because two teams, one in Education and Human Development and one in Energy, were also listed under Information, Society and Culture. Percentages assume each of these two teams is assigned to Education and Human Development and to Energy, respectively.

Focus groups. Evaluators asked each interviewed team leader to approve contact with their team's undergraduate and graduate student members to invite them to participate in a focus group discussion. Focus groups were semi-structured and lasted approximately one hour. All team leaders approved and evaluators conducted focus groups with students from 14 out of the 15 teams (93%).[3] Topics included research and research preparation, teamwork and decision-making, and general experiences in Bass Connections.

Evaluators audio-recorded all interviews and focus groups and sent the recordings to a professional transcription service; evaluators also took notes on nonverbal cues not captured by the recordings. Interview and focus group transcriptions and observation notes were imported into NVivo, a qualitative data analysis software package. Evaluators used a combination of holistic, descriptive, and in vivo coding approaches; manually assigned the resulting codes; then examined code frequencies. Then, pattern coding extracted the major themes and evaluators used analytic narratives and direct quotes to summarize the qualitative findings.

Surveys. Whereas team observations, team leader interviews, and student focus groups were conducted with selected teams, a web-based survey was designed to gather data from all participants. The Program Development Group drafted three versions of the survey instrument: one for undergraduate students, one for graduate students/postdocs, and another for team leaders. In an effort to maximize the sample, evaluators sent an initial email invitation and three follow-up links to students and team leaders to urge them to complete a survey.

All participants were assured confidentiality. Undergraduate and graduate student/postdoc survey items queried team structure and process; faculty and student connections; changes in knowledge, skills, or attitudes; team challenges; professional development; overall satisfaction; and student perceptions of

[3] One team declined the invitation to participate in a focus group.

program sustainability. Project team leader items covered team structure and process; teamwork; motivations for participating in Bass Connections; and perceptions of program sustainability. All survey versions ended with a series of open-ended items about what worked and what could be improved. The surveys took approximately 15 minutes to complete.

Evaluators sent a survey link to all 155 team leaders 215 undergraduates, 64 graduate students, and 4 postdocs who participated on a Bass Connections team. Surveys were completed by 103 (68%) team leaders and 118 (42%) students and postdocs.[4] These response rates were similar the Phase One survey, when 75% of team leaders and 38% of students responded (note the number of potential participants was much smaller in Phase One). Responses by undergraduates, graduate students, postdocs, and team leaders by Bass Connections theme are shown in Table 2.

Table 2. Survey responses by Bass Connections theme. Percentages indicate the proportion of responses for each type of team member within each of the five themes.

	Undergraduates		Graduate Students		Postdoctoral Scholars		Team Leaders	
Theme	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**
Brain and Society	21	(54)	7	(58)	2	(67)	24	(71)
Education and Human Development	19	(29)	0	(0)	0	(0)	20	(69)
Energy	17	(36)	18	(62)	0	(0)	22	(88)
Global Health	15	(88)	6	(35)	0	(0)	24	(92)
Information, Society and Culture	7	(12)	5	(50)	1	(100)	13	(46)
Total Number	79		36		3		103	

Note: Percentages are calculated within theme and so do not total 100%.

Fifty-one of the 54 project teams were represented in team leader survey responses, student responses, or both. Team leader survey responses represented 50 teams, 12 of which were not represented in the student survey data. Student survey responses represented 41 teams, 2 of which were not represented in the team leader survey data.

Survey data were imported into SAS and cleaned (dropping duplicate responses, accounting for missing data, and recoding as needed) before analysis.

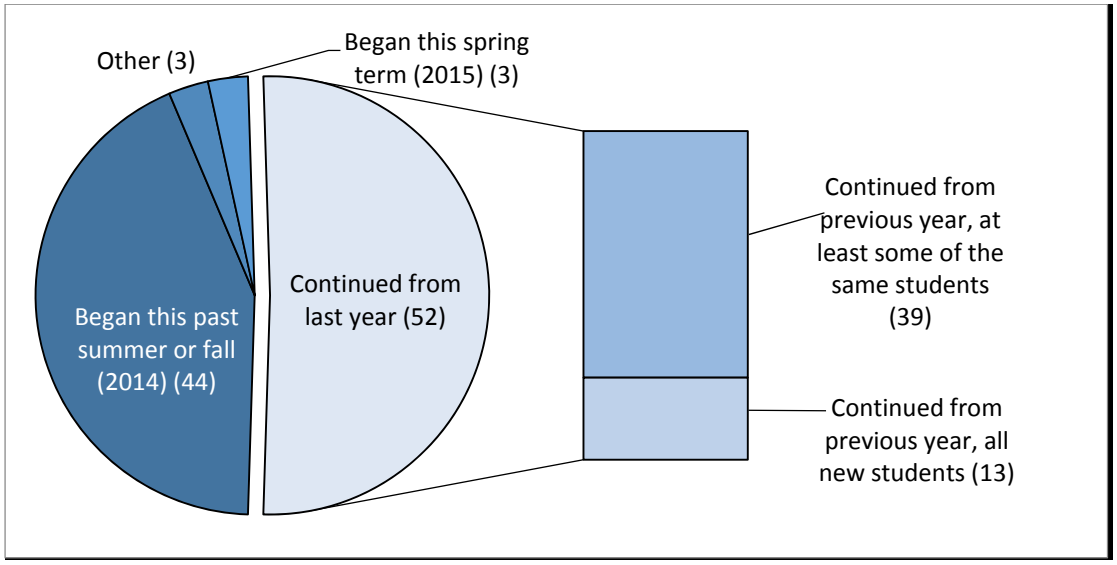
Team Characteristics: Composition and Meetings

Team composition. About half (52 of 102) of the 2014-15 team leader survey respondents were leading teams that had met in some form in the previous year (see Figure 1). As a result, the level of awareness

[4] Several team leaders and students were on more than one team and they were asked to complete surveys that reflected their distinct experiences on each team. As a result, 10 team leaders and 3 students completed two surveys.

and experience related to project content and teamwork was presumably farther along than for newly formed teams.

Figure 1. Slightly more than half of team leaders (52) led teams that had met the previous year, and most of their teams (39) had at least some of the same students.



Note: Based on team leader survey responses (n=102); numbers of team leaders in each category appear in parentheses.

Team leaders responded to questions about team composition in both the quantitative and qualitative data; specifically, questions probed team processes and composition, project management roles, and time spent on the project. These questions were important because, since its inception, Bass Connections has intentionally been non-prescriptive, giving each theme the freedom to develop its own team guidelines. With this in mind, a central purpose in the Phase Two evaluation was to explore whether identifiable models were emerging among teams.

Evaluation data suggested that some themes adopted a relatively more structured team framework (e.g., requiring activities or templates) and others deferred to team leaders. Observations, interviews, and focus groups identified three prevalent team models.[5]

- *Single Team Project:* All members of the team collaborate on a single research project. Team members are often assigned a specific task to work on independently, but the team met regularly to review the work and complete a final product. Eighteen teams in the evaluation could be described as single-team projects.
- *Team Subgroups*: The larger team splits into multiple smaller teams, consisting of at least two undergraduate or graduate students and a faculty member. The smaller teams work on distinct projects that somehow connect to a larger team question or goal. Ten teams in the evaluation followed this model.

[5] Note that these observations do not describe every team because not all teams contributed data in this evaluation.

- *Independent Projects:* These teams are similar to independent studies; an undergraduate student works on a specific project under faculty advisement. This model described six teams in the evaluation.

Another aim of the evaluation was to explore whether team leaders were satisfied with the number of undergraduates on their team. Most team leader survey respondents (81%) indicated that they had "just enough" undergraduate team members. Another 13% of team leaders reported having too few undergraduates, a finding that was echoed in some team-leader interviews. Team composition is not likely a one-size-fits-all matter and may vary depending on the nature of the project, the number of team leaders, and the team structure. Theme and team leaders will likely continue to hone their ability to right-size teams based on projects, processes, and needs.

Team meetings. Phase One evaluation findings identified scheduling meetings as a big challenge. Phase Two survey data suggested teams used creative ways for the entire team to engage in the project by, for example, incorporating virtual as well as in-person meetings, and by adding subgroup gatherings.

Both team leaders and students reported that teams met as a whole and/or in subgroups, but team leaders and students diverged when they reported how often they met. These findings, shown in Appendix A, suggest that more team leaders reported weekly meetings (as a whole or in subgroups) than students, and more students than team leaders reported they met only once a month. Only 6 students—compared with 13 team leaders—reported the entire team met more than once weekly. These discrepancies in reporting suggest several interpretations. First, the survey samples of students and team leaders do not entirely overlap. Second, team leaders may feel pressed to report they are meeting relatively more often, in light of their perceived responsibility as a leader. Third, students and team leaders may have different perceptions of what is meant by subgroup and entire team.

Findings

Six findings emerged from the evaluation.

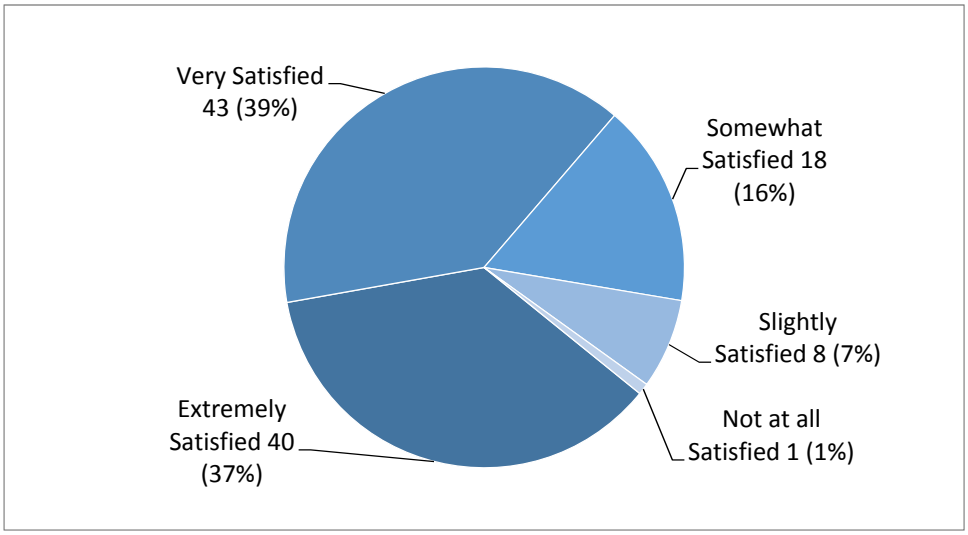
1. Students and team leaders reflected positively on their team experience.
2. Most project teams incorporated the three fundamental elements of Bass Connections.
3. Both students and team leaders need a balance of freedom and structure to make the most of their team experience.
4. Collaborative teamwork is central to positive team dynamics and overall team satisfaction.
5. Graduate student and postdoc involvement is mutually beneficial.
6. Structural changes could enhance sustainability.

Each is presented in turn below.

Finding 1. Students and team leaders reflected positively on their team experience.

Survey data suggests that most students (76%) were either extremely or very satisfied with their Bass Connections experience (see Figure 2 below). Nearly all student survey respondents (94%) indicated that they would recommend Bass Connections to a friend.

Figure 2. Most student survey respondents (76%) were extremely or very satisfied with Bass Connections.



Note: Based on student survey responses (n=110).

Students particularly valued the opportunity to build connections with faculty and other students through teamwork, to engage in hands-on research, and to work with faculty and students from multiple disciplines. As shown in Table 3, students rated their team leaders highly across items designed to capture the intent of the team experience.

Table 3. Students gave team leaders high ratings on several aspects of team leadership, on a scale of 1 (Not at All) to 5 (A Great Deal).

	Mean	SD
Opportunities for students to shape the project	4.46	0.75
Help when needed	4.39	0.89
Support for collaboration among students and faculty on your team	4.35	0.86
Opportunity for interdisciplinary collaboration	4.29	0.91
Opportunities to engage in hands-on research	4.28	0.98
Enough direction to guide the team	4.16	0.94
Instruction in the topic area	4.09	1.03
Instruction in research methodology	3.89	1.12

Note: Based on student survey responses (n=106–110).

Among the plethora of offerings at Duke, students reported that Bass Connections provided something unique to their learning experience. Students cited the teams' mix of disciplines and learner levels, research experience, community engagement, and real-world research application as part of the unique experience. The following comments exemplify this point.

- *"I think the interdisciplinary collaboration in which professors, graduate students, and undergraduates are equal team members is unique. I love that I was able to help guide the project's direction."*
- *"It [showed] me the process it takes to formulate a research project, to get it approved and funded, and the detailed steps that must be taken for the project to be successful."*

Undergraduates attributed a range of improvements in knowledge and skills to their Bass Connections experience (see Appendix B). Over half of undergraduate survey respondents indicated great or moderate improvement in interpersonal and communication skills such as approaching faculty, graduate students, and postdocs; working with team members from diverse areas and with external stakeholders; communicating with a team; and comfort asking about unfamiliar topics. In addition, students indicated improvements in content knowledge and skills such as connecting research to social issues, conducting and presenting research, and engaging in complex problem-solving.

Qualitative data documented student reports of opportunities to engage in all aspects of research, giving them the tools to cultivate their skills. Bass Connections transcends the traditional research lab model and offered students the ability to engage beyond assigned tasks. It gave students across a range of learner levels the opportunity to work directly with faculty members, participate in decision-making, and ultimately see how their work contributed to the broader research goals. Students also became aware of both the benefits and challenges of research, giving them a clear sense of what research entails. One student commented, "The most valuable aspect was being able to be a part of actual field research and experience the political and social dynamics that influence the production of science."

Students reported gaining interest in new topics, valuable experience for their résumé, and a story to tell prospective employers (see Appendix C). Bass Connections also provided students with the opportunity to explore academic and career interests.

- *"And I think it's also giving me a little bit more perspective in terms of what I'm interested in and areas I'd like to take some of those interest in. I'd never really thought about academia as a potential career path, but it's something that I've thought about. Like, 'hey, maybe a PhD could be fun.'"*
- *"I talk about it a lot in interviews, which I didn't anticipate. Like, I do a lot of things, and so the number of things I talk about in interviews is relatively small."*

Team leaders also had highly positive experiences with their Bass Connections teams (see Table 4). For example, team leader survey respondents reported that their team worked well together, team members were committed to achieving project outcomes, and students were prepared to engage in the work. Team leaders also reported feeling supported by their theme leaders and staff.

Table 4. Team leaders agreed with positive statements related to how well their team worked together and to how supported they felt, on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree).

	Mean	SD
My team worked well together	4.43	0.80
My fellow team leaders were committed to achieving the project outcomes	4.36	0.76
Students on my team were committed to achieving the project outcomes	4.35	0.86
Students regularly attended our team meetings	4.28	1.00
I have felt supported by my theme leader(s) and staff	4.21	0.79
Students were sufficiently prepared to engage in the work	4.04	0.95

Note: Based on team leader survey responses (n=92).

The Phase Two evaluation looked more deeply into issues of the sustainability of Bass Connections teams. Part of understanding sustainability is determining what motivates team leaders to become involved then stay involved. As shown in Table 5, team leaders reported that the opportunity to connect with other Duke faculty, mentor students, engage in interdisciplinary work, and conduct innovative research were most influential in their initial decision to participate in Bass Connections. Far less important were opportunities to obtain funding for research or to gain recognition. Whereas team leaders reported valuing connections with their fellow team leaders, expanding their professional network was not among the most prevalent motivators for becoming involved at the outset.

Table 5. Team leader mean ratings demonstrating the extent to which the following influenced team leader decision to participate in Bass Connections, on a scale from 1 (Not at All) to 5 (A Great Deal).

	Mean	SD
To be a part of something innovative	4.29	0.75
To be part of a multidisciplinary team	4.04	0.92
To mentor students in a different way	3.97	1.00
To start a new research project	3.35	1.40
To expand my professional network	3.12	1.21
To sustain an existing research project	2.80	1.46
To get financial support for new/ongoing research	2.61	1.42
To gain public or professional recognition	2.16	1.10

Note: Based on team leader survey responses (n= 91–97).

Finding 2. Most project teams incorporated the three fundamental elements of Bass Connections.

As an innovative endeavor, Bass Connections has been evolving since its inception. In addition to the Phase One evaluation, evaluators have engaged in ongoing conversations with administrators and engaged stakeholders in developing a logic model to describe initiative goals, activities, outputs, and outcomes. This process has affirmed three fundamental elements of Bass Connections integral to successful teams: research, integration (across disciplines, learner levels, and between Duke and external partners), and team-based problem solving.

As shown in Table 6, most teams incorporated the fundamental elements of Bass Connections, with greatest emphasis placed on research and least emphasis placed on engagement with the broader community. Team leader and student ratings on each element were similar except on the interdisciplinary nature of the team, where faculty members rated slightly higher than did students.

Table 6. Students and team leaders agree on how much their teams incorporated research, vertical integration, and engagement with an external partner but differed slightly in ratings of interdisciplinarity, on a scale of 1 (Not at All) to 5 (A Great Deal).

	Team Leaders		Students	
	Mean	**SD**	**Mean**	**SD**
Research	4.26	0.94	4.24	0.90
Varying levels of expertise (vertical integration)	4.19	0.88	4.20	0.90
Varying areas of expertise (interdisciplinary)	4.24	0.74	4.11	0.88
Engagement with the broader community outside Duke	3.85	1.75	3.89	1.12

Note: Based on survey responses from team leaders (n=99–100) and students (n=114–117)

Research. For the purposes of this evaluation, research was defined broadly as information gathering. Most of the students who participated in team focus groups reported that their team had engaged in gathering data, quantitative and qualitative data analysis, and/or writing manuscripts. Qualitative findings indicated that nearly all teams participated in some form of research, and that whether they engaged in research or not they felt strongly about it. This came across as either enthusiasm for research experiences they did have, or of deep disappointment when their research expectations were not fulfilled. One student described their positive experience: "I helped design the survey, pick ages, do research on time points, and then we did dosing curves. So we did acute dosing, which was really cool. We got some interesting results just from that alone that I presented at [a research symposium]."

Two students remarked on their disappointment when their team didn't provide the research experience they had expected.

- *"It doesn't seem to be very focused on research, which Bass Connections is kind of advertised as research teams. So yeah, so research teams, whether it's quantitative, like doing statistical analysis, things like that, using programs like that. Or qualitative, teaching us how to do focus group interviews. I thought that I would learn more research skills. That didn't end up happening."*
- *"…the projects, I think, are less – I mean I don't even know if they're research projects per se. They're more like, just kind of like – they're projects. They're not research."*

One team leader suggested that students may come into the team looking for a particular kind of research, only to find that the broader definition for some teams takes some getting used to.

- *"…to them, this was not research because there were no numbers. Especially one in particular, the student who was the most outstanding student and then eventually got the most out of the experience at the end. He was really unhappy that he was not getting numerical data to analyze. It took him a long time to buy into the idea."*

Integration. Qualitative data indicated that most teams incorporated integration across disciplines, learner levels, and between Duke and external partners. Bass team proposals must come from at least two faculty members from different disciplines and students are recruited from different areas. Data indicated that nearly all teams were interdisciplinary; however, in several cases, one team leader was significantly more engaged in team activities than the others. Having one "lead" team leader may not be in keeping with what administrators intend to happen on teams, but it may reflect a practical reality: some faculty may want to be involved but cannot be in light of the time it takes.

Teams that feature vertical integration engage members across learner levels, and most teams included faculty, undergraduates, and graduate students. Other team structures included faculty, undergraduates, and staff; and faculty and undergraduates. Some teams included external partners as members of the project team.

Fewer teams incorporated engagement with the external community. Some projects had real-world applications but the team did not directly engage with individuals outside Duke. Of those who did engage with an external partner, most engaged either globally (13 teams) or within the Durham community (9 teams). Some teams functioned as consultants for external entities such as non-profits, companies, and community organizations. For example, one team worked to provide insight on how a company's energy consumption varied across facilities. Another team provided a community-level service by installing tools to improve buildings' energy efficiency.

Team-based problem solving. Most teams reported that they worked collaboratively on their project. Faculty and students met regularly to discuss project design and analysis, faculty actively sought student feedback, and students were engaged in hands-on support during project implementation. Although most teams reported working collaboratively, nearly a quarter of the teams (22%) reported minimal student and faculty collaboration. Teams that met more often tended to report higher levels of teamwork. One student explained his/her experience of a disconnected team: "We met once every two weeks, or something like that, just to touch base on what's happening, exchange information, and so on. At the end there was mostly a lot of independent work."

Qualitative data revealed a strong relationship between team collaboration and shared social experiences beyond focused project work. Teams shared meals, engaged in ice-breaker activities, and participated in other team-building exercises such as cooking classes or outdoor activities. Social activities were not only enjoyable for both faculty and students, but they also offered students an opportunity to interact with faculty outside the academic setting and break through hierarchical barriers. One undergraduate commented,

- *"And the professors were actually, a little intimidating in the beginning …]. I think [the faculty] actually turned out to be very helpful. We went out to lunch with them and it was just great to see them on a different level than in a classroom or behind some sort of desk. That was really great."*

Finding 3. Both students and team leaders need a balance of freedom and structure to make the most of their team experience.

Students identified the opportunity to take ownership of a research project as one of the most unique and rewarding experiences. Taking ownership mainly consisted of students designing their own projects and participating in decision-making. Offering students the opportunity to actively participate in research increased student engagement, team collaboration, and overall satisfaction with the team experience. Students were excited about attending meetings, discussing their work, and presenting their work to the greater community. Two student comments illustrate their engagement.

- *"I love that at least our mentors really let us design our own projects, which was cool for me. So I got to take what we learned from the initial survey and then design a project. Everyone has been very supportive because I feel like it's kind of a crazy idea. Do you want me to talk about it?"*
- *"But this semester, we have to actually like make the decisions and do the things. So like they have very strong opinions on what they want us to do, but ultimately, we're the ones doing it. So we really needed to decide on what we want."*

Students welcomed the opportunity to explore research possibilities and ultimately design their own project; however, many students requested more team leader scaffolding. Specifically, they wanted clear direction, deadlines, accountability, structure, agendas, and milestones. The following student statements describe the desire for additional structure and support.

- *"Because it's so open and so free, sometimes we just felt like we lacked direction and weren't sure where we were going. In a way, that's part of the experience, but, really, at times, we were just lost and stuck. We would talk to the faculty but they wouldn't have that strong of an idea of where to go either, because it is our project and not so much their project."*
- *"I think the least favorite was just sometimes I just felt like I didn't know what was happening. I didn't know what I was expected to do for the next step, because sometimes we have two weeks in between. Sometimes we had a meeting and the faculty would not help directly because you just need to figure something out on your own. By the very virtue of having little structure and guidance, sometimes I just felt lost about what I was doing."*

Setting clear project and personal goals up front offered an additional layer of purpose and structure. Project-wide goals gave students and team leaders the direction necessary for moving forward, whereas personal goals offered students the opportunity to align the work and specific roles to their interests. Many teams set team-wide project goals, but only a few encouraged students to set personal goals. The few students who did set personal goals were happy they had. One undergraduate remarked, "I think Bass Connections can give you a lot of great opportunities – you just have to have the goal you want out of it first. From there, I think you can be really successful."

Added structure in the form of information for prospective team members could enhance students' experience. Student focus-group participants advised prospective undergraduates to be thoughtful when choosing a project and to be ready to commit to it. They recommended students find a project they are passionate about by talking to team leaders and current participants before joining.

- *"I would recommend joining a project that truly excites you: while all of the Bass Connections projects are interesting and intellectually rewarding, they require significant time and personal investments into the project. Prior to selecting one, it is helpful to consider why you are applying, your goals in participation, and how you see the project relating to your academic, personal, and long-term interests."*

- *"Make sure you have the time required to dedicate to the project, so that you can really get the most out of it."*
- *"Find out as much as you can about the team, the professor, the work style etc. Speak to previous student team members if possible."*

Helping prospective students learn more about the teams they are considering by producing a "selection guide" or revisiting the form and function of an open-house event where students could meet team leaders could help students get the information they need to make an informed decision.

Team leader survey data echoed the students' concerns about structure. When asked what they would do differently, most team leaders stated that they would have "more structure and clarity; set expectations; and set group-wide and individual goals." One team leader said: "Have a direct plan for the students to follow – sometimes it felt like I was walking in the dark." A small number of team leaders reported that they had adopted a team charter or other planning document to guide their work—a formal process to set expectations from the outset is one approach to providing the kind of structure some were wishing they had had.

Finally, added structure from Bass administrators—centrally or from themes—might help team leaders, particularly new leaders, understand how to approach teamwork. Similar to ratings in the Phase One evaluation, team leaders were not entirely clear about the goals of Bass Connections as a whole (Phase One mean = 3.55, Phase Two mean = 3.82). This uncertainty suggests that more direct and clear messages about Bass Connections is needed.

Team leaders shared ideas for structures they had found or thought would be helpful. One appreciated his/her theme's efforts to bring team leaders together:

- *"What Global Health did was really nice. We would have meetings and we would go around the table and talk about what we were doing. It made me felt like oh I'm meeting these people and they do this community-based participatory research and they get what I'm doing."*

Another suggested that sharing potential team models would be helpful.

- *"At some point, I really was making it up. I had a sense of what they intended and I know my project– but I really, even now, I don't know how to compare what I did with what other people did. We have those dinners, which are lovely. You never really have an in-depth conversation though, off on some tangent. So, it'd be kind of nice to see, you know, here are three different ways people structured their Bass teams, which would give me a lot of ideas."*

Peer-to-peer learning opportunities for existing and new team leaders could promote the feeling of community among team leaders within themes while providing a forum to share ideas and approaches to creating successful teams.

Finding 4. Collaborative teamwork is central to positive team dynamics and overall team satisfaction.

Team leaders and students identified team collaboration as one of the most valued and appreciated aspects of Bass Connections. Students valued the opportunity to work closely with faculty, and faculty enjoyed mentoring driven, creative, and engaged students. Team leaders also appreciated the opportunity to connect with other faculty.

Team leaders' level of attention to building teamwork and establishing a collaborative environment was a particular focus of the Phase Two evaluation. The interpersonal and communication skills needed to

build relationships among team members, particularly across learner levels, are not necessarily emphasized in a typical research project, and administrators were interested in how team leaders thought about this part of teamwork. Team leader survey data confirmed the role of an intentional approach to teamwork as an essential element of the Bass Connections experience. Among the 96 team leaders who responded to a survey item about how they approached teamwork, most (68%) reported their teams had discussed ways to enhance teamwork and half (51%) spent time on team-building activities. Of the 44 respondents who engaged in teamwork activities, nearly all (93%) found it contributed to greater team collaboration.

Team collaboration was featured in most teams across all themes; for example, evaluators observed faculty and students developing surveys together, discussing analytic approaches, creating educational resources for teachers, and brainstorming ideas for new research projects. One student described the team's collaborative spirit.

- *"I think the mentorship has been great, and I also think our PIs and grad students are what you were saying earlier when you asked whether the varying levels of knowledge was a problem, and I would say no. They're very non-pretentious, especially given the level of success that they have had. But seriously, I think they're very accessible. They listen to our input. They're willing to help us and think of us almost as equals."*

When asked how his/her team developed projects, a team leader talked about group decision-making: "I think the pragmatic one really was – it was some – what's the word I want; gestalt. I never would have come up with that by myself, and [other faculty] wouldn't have either."

Qualitative data suggested that teams engaged in social activities demonstrated strong collaboration among faculty and students. In the following statement, a student describes a social activity to define the team.

> *Evaluator: "What makes your team a team?"*
> *Student: "Cooking together. It was a big metaphor for teamwork: finding the recipes, splitting the tasks, communication, sharing the tools, and knowing which tools to use."*

Open-ended survey data also suggested that team collaboration was the main contributor to student satisfaction. The greatest number of students attributed their satisfaction to having a "good team experience" with strong faculty and student support. The inverse was also true: students identified negative team dynamics—poor leadership, little collaboration, unequal distribution of work, and low student engagement and accountability—as prevalent sources of student *dis*satisfaction.

Developing faculty connections is an important feature of Bass Connections. Faculty appreciated the opportunity to connect with faculty from other disciplines and engage in research they might not have considered otherwise. One team leader commented, "This has given me the unique opportunity to interact with two other faculty members outside of my school that otherwise I probably would have not met. I have learned a lot from them."

Some team leaders attributed new connections across disciplines, learner levels, and with community partners to their Bass Connections participation (see Table 7). Connections to undergraduates were most prevalent, whereas new contacts among community partners were the least common. Lower ratings for connections with graduate students likely reflect their relative scarcity on Bass teams, particularly in some themes.

Table 7. Team leaders attributed new connections across disciplines and learner levels to Bass Connections, on a scale of 1 (Not at All) to 5 (A Great Deal).

	Mean	SD
Undergraduate student team members	4.00	0.91
Faculty outside your discipline/department	3.59	1.16
Graduate student team members	3.13	1.51
Community members outside of Duke	3.06	1.37

Note: Based on team leader survey responses (n=96–97).

In interviews, team leaders said successful collaborations with other faculty did not require long-standing connections prior to beginning a team project as long as team leaders shared or set explicit project goals at the outset. Some team leaders noted that it could be difficult to find faculty partners outside their discipline because disciplines still tend to stay isolated from one another, despite the interdisciplinary culture at Duke. A few team leaders suggested that Bass Connections host matchmaking events to offer faculty an opportunity to meet and discuss project interests and goals. One suggested, "In some ways I feel like there are lots of cool people in the university that one could have a team with, and one doesn't know they exist, so some kind of matchmaking or speed dating [would help]."

Finding 5. Graduate student and postdoc involvement is mutually beneficial.

Data revealed that graduate students and postdocs provide day-to-day mentoring to undergraduates. They bring a level of structure and support that undergraduates seek and faculty team leaders may not have time to provide. In focus groups, undergraduates—particularly underclassmen—said they often felt intimidated by faculty members and appreciated having a graduate student or postdoc on the team to answer questions or address immediate concerns. Undergraduates admired the passion the graduate students and postdocs brought to their work; their energy became infectious – undergraduates emulated their behavior and in turn became more excited about the work.

- *"[Graduate student] is very approachable and very knowledgeable so having her as kind of like the intermediary between us and professors was definitely nice and helpful, much more casual relationship than meeting with [faculty]."*
- *"There were moments…where we didn't engage in the project as much as we should have and [graduate student] was super passionate about it and putting in her all and it was inspirational."*

Graduate students and postdocs also benefitted from participation in Bass Connections. It offered them the opportunity to build relationships with faculty, other graduate students, and postdocs. It also provided mentorship experience for graduate students, giving them the opportunity teach, advise, and collaborate with undergraduate students.

- *"I have actually never supervised many students at one time, at least not students who are in the lab full-time and I think the model at Duke is often to have maybe one independent studies student and then minions who's paid to come in like do the very basic things so I think it's been a nice challenge to keep up with each other, projects and papers and kind of assess where they are in their understanding of different aspects of the process. So it's been helpful and it's kind of like a mini lab like practicing for being a PI one day."*

- *"It allows you to have really good connections. So I wanted to work with [faculty] before coming to Duke. I wrote my comment essay about his [content] class and him specifically and his research. But I don't necessarily think I would have been able to do it otherwise. So I think it was a really good opportunity to get into a field I was interested in but wouldn't have necessarily had the access to."*

These data describe a mutually beneficial experience when graduate students or postdocs are included on Bass Connections teams. The time required of faculty team leaders was eased, and graduate students and postdocs gained skills and experiences that are critical for their professional development regardless of their chosen career path. According to program administrative data, teams in Global Health and Energy themes were more likely to include graduate students.

Finding 6. Structural changes could enhance sustainability.

Faculty and students appreciated the opportunity to connect with the Duke community and work together to tackle real-world problems. Most team leaders were participating or intended to participate for more than a year: nearly three-quarters of survey respondents indicated that they were "very likely" or "extremely likely" to participate again and, as shown in Figure One, about half were leading a team for a second year. At the same time, however, team leaders were skeptical about their ongoing participation, citing time and funding constraints. Over half (55%) of team leader survey respondents were concerned about sustainability because of the faculty commitment it required (Appendix D). A combination of enthusiasm for the experience mixed with concerns about the time required and a wish for some remuneration or recognition emerged as strong themes related to sustainability.

The most prevalent challenge among team leaders who were interviewed for the evaluation was the time required to lead a team. In particular, team leaders talked about the time it took to deal with administrative tasks, such as scheduling team meetings or managing student stipends. Many teams had difficulty meeting on a weekly basis, despite their willingness to meet in the early morning or evening, in subgroups, or remotely. Team leaders recommended setting meeting schedules in advance to give everyone the opportunity to plan accordingly.

- *"The hardest thing for me was scheduling the damn group… I should've been able to anticipate that if you're getting mostly over scheduled, hardworking, over-ambitious students that they're going to be over-programmed and finding a time to meet will be the hardest thing on the planet. That has been enormously difficult for my team."*
- *"What would've made things a lot smoother is if [they] actually had you register for the project so you'd have a specific day and block of time. We spent several weeks at the beginning of this semester trying to figure out when everyone on our team could meet and it was very difficult."*

Setting team meeting times before recruiting students should be an easy step that would avoid this prevalent issue. Recruiting a team member to play the role of project manager who could help with this and similar practical matters further enhances team functioning. Qualitative data suggested that team leaders recognized that they needed a project manager. About half of the team leader survey respondents reported having someone in the role of project manager. Staff members were most commonly identified as project managers, but faculty members were nearly as common, suggesting the burden of seeing to project details may still fall to team leaders.

One former team leader's comment exemplified the tension between wanting to give the team the time required and keeping up with scholarship.

- *"…It's possible that I shortchanged myself on some publications I could've gotten because I was dedicating time to the students. I feel like it was all really worth it to me in the end for my training for me personally but ultimately a lot of times the PIs just want you to write more papers and so if that's not what you're doing with their lab time or whatever then it can create a conflict."*

The most prevalent recommendation for improving Bass Connections among team leaders was salary support, course release, or some form of recognition for leading a team. One team leader commented on this issue.

- *"So what is that incentive? And I do think it has to be related to things like course relief, committee – whatever it is, there's 24 hours in the day, and if you're committing X number of hours to a Bass team, that's gotta show up in how you're evaluated as faculty in terms of your course load or committee loads or financially."*

Student attrition also posed a challenge since some students were unable to commit to their project. The following comments illustrate team leaders' concerns that student attrition disrupted team dynamics and led to unequal (and unexpected) work distribution.

- *"Unfortunately some group members never showed, and there really isn't a good enforcement mechanism."*
- *"I think [the student] just felt bad. He's a good kid, and I think he's just spread thin like many Duke undergraduates are. Some of this requires some initiative on your own, and it's easier, maybe, to call in sick or blow off a lab thing than it is an exam."*

In Phase One evaluation findings, team leaders expressed concern that students often lacked basic content and research knowledge, and that their lack of preparation hindered progress because students were not ready to jump into the project work. This year's evaluation data did not reflect this concern among team leaders; instead, team leaders identified their students as smart, interested, and engaged. However, concern about preparation did appear among the students themselves, who were worried about their level of content knowledge and lack of experience writing literature reviews and working with statistical software. The following comments from two undergraduates explain their concerns about contributing meaningfully to the project.

- "*I felt a lot less confident about my skill set coming in. I've taken a long time to learn how to use the tools and I've also felt uncomfortable that I'm not contributing enough to the project. And that there are these knowledge gaps that I have. So I think that's been kind of a slow thing and something that I've been concerned about throughout this experience."*
- *"But it was also kind of frustrating for me last semester because, for one thing, this is totally out of my area. So I was doing a lot of catch up, too. But I also like wasn't really sure how to."*

In keeping with the larger Bass Connections model that involves creating interdisciplinary pathways of learning into and out of project teams, team leaders and students commented that integrating Bass Connections to the curriculum would help address these challenges. Two students' comments illustrate this point.

- *"Make sure there is enough room in the curriculum for the project to evolve to provide the maximum benefit to students and the community. Also, try to get courses to count for certain curricular requirements. It's difficult for many students, particularly engineers, to take courses just because it's an interesting topic or is a great class."*

- *"Make all projects a little more streamlined. Focus on clearly outlining what undergrads will be doing. Make the course credits useful to students' majors and graduation requirements. Currently I have done three credits through Bass Connections with no benefit to my graduation."*

Conclusion

The Phase Two evaluation of Bass Connections delved more deeply into team structure and process, and highlighted strengths and limitations of Bass Connections. In keeping with the developmental evaluation approach, the purpose of the inquiry was to inform the continuing growth of the initiative, indicating potential pathways for the coming years and building knowledge to inform future evaluations. The following themes emerged from qualitative and quantitative analyses.

1. Students and team leaders reflected positively on their team experience.
2. Most project teams incorporated the three fundamental elements of Bass Connections.
3. Both students and team leaders need a balance of freedom and structure to make the most of their team experience.
4. Collaborative teamwork is central to positive team dynamics and overall team satisfaction.
5. Graduate student and postdoc involvement is mutually beneficial.
6. Structural changes could enhance sustainability.

High levels of satisfaction and reported gains among students and team leaders strongly indicate Bass Connections teams have succeeded in providing a positive and unique experience. Evidence that project teams incorporate research, integration (across disciplines, learner levels, and between Duke and external partners), and team-based problem solving, indicates teams are aligned with these essential elements.

Bass Connections affords a high degree of freedom to teams and team members. Evaluation findings suggest the team experience is best for team leaders and students alike when they're given some structure alongside the freedom. Students sought guidance from team leaders and reported that timelines, deadlines, team goals, and personal goals were helpful to their experience even as they enjoyed the freedom of being part of a creative process. Team leaders would benefit from guidance from theme and central administrators about Bass Connections goals, expectations, and suggested team models.

Students and team leaders noted the importance of collaborative teamwork across and within learner levels. Undergraduates valued collaborating with graduate students, postdocs, and faculty, and faculty reported deeper and new connections to one another.

Changes to team structure and in the way Bass Connections fits in the larger Duke curriculum could enhance sustainability for faculty. Undergraduates and postdoc team members were most common in two themes – Global Health and Energy. Wider participation across learner levels in all themes could enhance opportunities for undergraduates to connect to graduate students and postdocs and also alleviate some of the time pressure on faculty team leaders. Benefits would also accrue to more graduate students and postdocs, who gain experience in leadership and mentoring. Assigning the role of project manager to a team member has the potential to take the pressure off team leaders when it comes to practical details such as scheduling and other essential but time-consuming tasks.

Structural changes to the curriculum could address findings related to student preparation and faculty engagement. Phase One evaluation findings revealed team leaders' concerns about students' background knowledge and ability to engage in the project at the start. Although team leaders did not

surface this issue in Phase Two, students reported their own concerns about their readiness to contribute. This issue should be addressed as Bass Connections matures as an initiative and concentrates on building educational pathways into teams.

Evaluation findings add to programmatic information about faculty frustrations with the lack of recognition for leading Bass Connections teams. The message is consistent: faculty members enjoy leading teams but consider it akin to a volunteer activity when they do not receive course release or some other form of compensation for the considerable time and effort required. This was a strong theme in the evaluation, but compensation may be prohibitively expensive. Other ways to alleviate the demands of leading a team—increasing involvement among graduate students and postdocs or naming a project manager—could render faculty engagement more feasible.

These evaluation findings should be considered in context. Generalizability of results is limited: with a small number of teams within themes to choose from for the interviews and focus groups, even random selection does not assure representativeness. Observations were only of willing teams, and, despite good response levels, survey respondents were self-selected and we cannot say what inspired them to participate.

That said, these findings build substantially on Phase One data. Small changes to support teams and team leaders, such as providing more guidance on team structure and function, could enhance team leaders' involvement. Specific elements of teams, especially collaborative problem-solving, are consistently associated with good experiences. Bass Connections provides valuable exposure to and engagement in team-based research for student and faculty participants.

Appendix A: Students and team leaders disagreed in their ratings of how often their teams met over the course of the academic year. Values are numbers of respondents and percentages in parentheses. Bolded pairs of values indicate widest variation between students and team leaders.

	Frequency: entire team meetings		Frequency: subgroup meetings	
	Students n (%)	Team Leaders n (%)	Students n (%)	Team Leaders n (%)
More than once per week	**6 (5)**	**13 (13)**	**12 (11)**	**24 (28)**
Once a week	**17 (14)**	**36 (36)**	**10 (10)**	**28 (32)**
Two to three times per month	16 (14)	20 (20)	24 (23)	16 (18)
Once a month	**60 (51)**	**19 (19)**	**44 (42)**	**10 (11)**
Less than monthly	**15 (13)**	**9 (9)**	**15 (14)**	**7 (8)**
Other	**4 (3)**	**3 (3)**	0 (0)	2 (2)
Total	118 (100)	100 (100)	105 (100)	87 (99)

Note: Based on survey responses from students (n=105–118) and team leaders (n=87–100). Team leader subgroup percentages do not equal 100% due to rounding. Only team leaders who believed their team had met as subgroups reported subgroup meeting frequency.

Appendix B. Students attributed improvements in knowledge and skills to their participation in Bass Connections. Ratings were on a scale of 1 (No Improvement) to 4 (Great Improvement).

	No Improvement	Minor Improvement	Moderate Improvement	Great Improvement	No Improvement (Already a Strength)
	n (%)	n (%)	n (%)	n (%)	n (%)
Comfort approaching faculty or graduate students*	3 (3.9)	7 (9.1)	25 (32.5)	41 (53.2)	1 (1.3)
Working with team members from diverse areas of knowledge	5 (4.3)	14 (12.1)	40 (34.5)	54 (46.6)	3 (2.6)
Comfort asking questions about unfamiliar topics	6 (5.2)	18 (15.5)	35 (30.2)	52 (44.8)	5 (4.3)
Ability to connect my academic experiences to broader social issues	4 (3.4)	17 (14.7)	42 (36.2)	51 (44.0)	2 (1.7)
Research skills (e.g. literature review, research design, data analysis)	6 (5.2)	22 (19.0)	43 (37.1)	42 (36.2)	3 (2.6)
Comfort approaching faculty**	4 (10.3)	5 (12.8)	12 (30.8)	14 (35.9)	4 (10.3)
Communicating with a team	3 (2.6)	14 (12.1)	54 (46.6)	41 (35.3)	4 (3.4)
Solving complex problems	2 (1.7)	32 (27.6)	45 (38.8)	35 (30.2)	2 (1.7)
Working with external stakeholders	22 (19.0)	24 (20.7)	30 (25.9)	35 (30.2)	5 (4.3)
Presentation skills	9 (7.8)	26 (22.4)	40 (34.5)	31 (26.7)	10 (8.6)

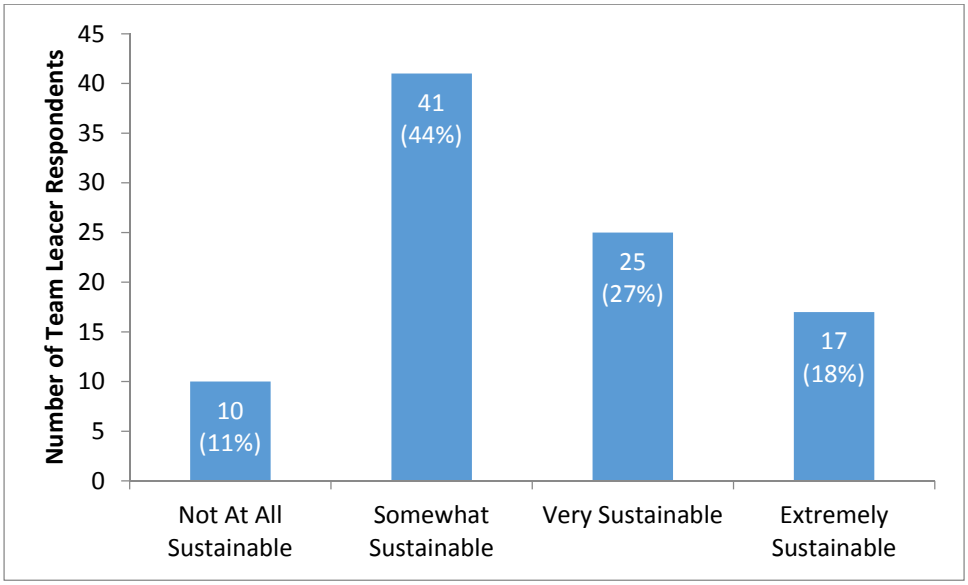
*Note: Based on student survey responses (n=116) except where *indicates n=77 (only undergraduates could answer) and **indicates n=39 (only graduate students and postdocs could answer).*

Appendix C: Student mean ratings of the extent to which Bass Connections' help shape future plans. Scale ranged from 1 (Not at All) to 5 (A Great Deal).

	Mean	Std Dev
It provided a story to tell prospective employers	4.09	1.02
It provided valuable experience for my resume	4.06	1.10
It got me interested in new topics	3.91	1.02
It provided me with valuable professional connections	3.65	1.32
It helped me realize what I'm good at	3.35	1.06
It re-affirmed my choice in major(s)/minor(s)*	3.12	1.31
It helped me realize what I don't like to do	3.06	1.18
It encouraged me to engage in new campus activities	2.98	1.35
It encouraged me to engage in new community service activities	2.48	1.33
It led to an internship/summer job opportunity	2.14	1.55
It helped me decide to change my major or minor*	1.77	1.11
It helped me decide to add a new major or minor*	1.73	1.15

*Note: Based on student survey responses (n=109–110) except where *indicates n=75 (only undergraduates could answer).*

Appendix D: Team leader ratings of Bass Connections sustainability in terms of faculty commitment.



Note: Based on team leader survey responses (n=93).