



Bass Connections Project Proposal Template for 2018-2019 Projects

1 PROJECT DESCRIPTION

Project title: Problem Based Learning to Improve Girls' Math Identity

Brief background/context:

Women continue to be underrepresented in STEM fields in the U.S. Math is a crucial component of so many STEM fields, and a gender gap among students in math interest and confidence begins as early as middle school. This project aims to inspire girls to change their own relationships with math both by building confidence, ownership, and self-sufficiency in problem-solving and by building an awareness of gender stereotypes and their potential impacts.

The gender gap in STEM fields exists at all levels, from childhood through career selection, and there are many different, but often related, causes for female underrepresentation found in recent research on the topic. Two major causes are students' math identity, or their beliefs, attitudes, and emotions about math, and societal views around gender as it relates to fields of study. Because we see math as a "masculine" subject, women and girls tend to feel they must *overachieve* in the field to be competitive, or even comparable, with their male counterparts. Additionally, the pervasive stereotype that STEM fields are "for men" can even have a negative impact on those who actively reject it.

Project goals and objectives:

This project is designed to address these two major causes by planning and running a series of free workshops for middle school girls that aims to improve their math identity. The resulting research will assess the impact of a problem-based discussion format with peers and undergraduate leaders on students' confidence and engagement in math.

All workshops will be designed with an interactive, problem-based curriculum. The materials and activities will encourage students to solve rich but accessible problems using many different approaches. Activities and discussions will be planned so that students can communicate their ideas about the problems and use and apply their existing skills in math and logic in new ways. As the program aims to include students of all learner levels, participating students will not be selected based on academic achievement, and problems will be approachable to all students, with extensions that can challenge the more advanced students. Because there will be no lecture component to the workshop, students may think of the problems less as in-class work, and more as "puzzles," where all skills that students bring from previous coursework are permissible for use, and students can work together and merge their skills to solve a given problem. The curriculum will also include developmentally appropriate discussions about gender stereotypes and their impact, especially as they relate to math performance. These discussions will build an awareness among the students about implicit bias and stereotype threat. All workshop activities will be led by female undergraduate students, who, along with the project co-leaders, will serve as positive examples of women engaging in math-related discussions for the middle school students.

Teaching math in a discussion-based format is challenging, so undergraduate student teachers will certainly develop their leadership skills by participating in this project. Students interested in careers in education will gain experience in classroom management and work with younger students, but all

undergraduate participants will gain valuable, transferable skills. Outside of the workshops, students will work together to plan activities, discuss their own ideas and approaches, and build an increased awareness of gender stereotypes. These discussions will be guided by the project co-leaders and will include team collaborators when discussing topics relevant to their respective areas of expertise.

Workshops will occur on Saturdays during the academic school year. Because students with limited financial means are affected during the summer by a long period without academic work, a free daytime summer workshop will also be run several times during the summer. Workshops will be planned so that students are not required to attend all meetings to participate fully in each day's activities.

Students will also have the opportunity to remain engaged with program by participating online. A regularly scheduled "puzzle" will be posted online and accessible to the students, and students may submit their ideas, solutions, and questions online.

There are many Duke programs and groups already organizing extracurricular STEM activities for local students, and the goal of this project is to work collaboratively, not competitively, with these groups. FEMMES is a student-run group which runs STEM-related after-school activities and Saturday afternoon programs for 4th to 6th grade girls in the area. Undergraduate students participating in this program, along with students interested in teaching summer, STEM-themed TIP courses would certainly benefit from structured training in the proposed program. These two Duke-affiliated programs have more broad themes in STEM, while the proposed project focuses exclusively on building confidence in math. Finally, the Duke math department supports initiatives to support women in mathematics, but these efforts focus on students at the high school and college levels.

Anticipated outcomes:

Assessment will occur through regular surveying of participants and parents, along with tracking program attendance. Participants will be surveyed regularly about their confidence and interest in math, along with their comfort level and participation in their math classroom at school. Participation in the online components of the program will also be tracked. Results of the first year of the program will be used for publication, but they will also be used to inform further research related to problem-based learning and the potential impact on girls' confidence in the classroom. A successful first year of this program will also empower undergraduate students to take greater leadership roles in the program in future years.

Project's relevance to the selected Bass Connections theme(s) and special funding opportunities selected (disregard if applying to open channel):

This project is being proposed under the Education and Human Development theme. The goal of the project is to make a positive impact on young girls and their relationship with math both in and out of the classroom.

Connection to team leaders' other projects:

This proposed project is a new collaboration by the included leaders and contributors. Our goal is to bring together previous research and work by the individual faculty members to collaborate on this very relevant combination of the respective areas of expertise: STEM and math education at the K-12 level, community outreach in math education, gender in the context of science and technology, the social development of adolescent girls, and causes and development of the gender gap in STEM.

2 TEAM LEADERS AND CONTRIBUTORS

<i>Name</i>	<i>Title/Rank</i>	<i>Team Leader or Contributor?</i>	<i>Department(s)</i>	<i>Led a Bass Connections team before (if yes, how many)?</i>
Sophia Santillan (primary contact)	Assistant Professor of the Practice	Team Co-Leader	Mechanical Engineering and Materials Science	No
Tori Akin	Assistant Professor of the Practice	Team Co-Leader	Mathematics	No
Martha Putallaz	Professor	Team Contributor	Psychology & Neuroscience	No
Ara Wilson	Associate Professor	Team Contributor	Gender, Sexuality & Feminist Studies	No
Lauren Valentino	Graduate Student	Team Contributor	Sociology	No

3 PROJECT APPROACH AND TEAM COMPOSITON

Project approach:

As outlined in the timeline, undergraduate student participants will meet weekly with team leaders (and contributors, when appropriate) during the fall 2018 semester to prepare for the next two semesters of the workshops. These meetings will be discussion-based, seminar-style sessions led by faculty and/or students, where all participants will discuss topics including teaching methods, gender stereotypes, and child development. Discussions will be guided by required reading, practice teaching sessions, and role playing exercises. All participants will be asked to reflect regularly on their program training and relevant experience in other settings (i.e., experience in other classes). Ongoing discussions and learning will occur during the following two semesters, as participants meet to discuss and gather feedback from preceding workshops.

A work study student will be charged with managing administrative planning duties, including registration of middle school participants, arranging transportation to workshops, purchasing additional materials as they are consumed throughout the program period. One faculty leader will serve as the program manager to work in tandem with the work study student on administrative tasks and large-scale program planning, and both project co-leaders will plan, administrate, and analyze surveys for regular program assessment.

Team composition:

The proposed project will include approximately 6 students, including 4-5 undergraduate students, and 1-2 graduate/masters students. It is critical that all participants be comfortable leading math-centered discussions, especially as the program emphasizes understanding and pursuing multiple approaches and points of access for any given problem. The math curriculum will be appropriate for middle school students of a wide range of abilities. A strong student team will include students from a diverse set of majors and/or career interests, including math, STEM fields, education, psychology, and gender issues. All participants should be comfortable, professional, and approachable around middle school aged girls.

Student opportunities:

All participating students will be interacting directly with workshop participants, so they will gain experience working in an education setting which they can directly apply to other educational activities, like FEMMES, TIP, or serving as a teaching assistant or tutor. Students will also develop leadership skills which they can apply everywhere, including project planning, public speaking, and critical thinking. Because the program incorporates discussion and study of a diverse range of topics, participants at all learner levels (including faculty) will gain a deeper understanding of an area that is new to them. Finally, a successful program will build an increased awareness among all participants of the complexity of the issue of the gender gap in STEM fields. Student participants will, by participating in the program and associated research, be included in associated publications.

Plan to evaluate team progress and performance:

Students will be asked to invest in training meetings by engaging fully in discussions and leading some sessions. They will be assessed by their participation in these meetings, their preparation for these meetings, and their work in developing materials for workshops. Students will also be given feedback about their participation in workshops themselves, and they will be tasked with giving each other constructive feedback regularly.

4 TIMELINE AND MILESTONES

Time Period	Participants	Content
Summer 2018	Team Leaders and Contributors	Building curriculum and training for undergraduate student participants
Fall 2018	Team Leaders, Contributors, Students	Training (including research and discussion) for undergraduate student participants; administrative planning of workshops, including advertising to area school students
Spring 2019	Team Leaders, Contributors, Students	Saturday workshops
Summer 2019	Team Leaders, Contributors, Students	Summer workshops

5 BUDGET ESTIMATE

Bass Connections Project Budget Template

Cost Category	Bass Connections Project Funding Request for 2018-2019	Notes (e.g., name of personnel, activities supported)
Payroll-allowable Categories		
GRADUATE OR RESEARCH ASSISTANTSHIP (PHD) (suggested range: \$15-18/hour; note: RAships for students in the Graduate School should include costs for tuition remission and fees)	\$	
RESEARCH ASSISTANTSHIP (Masters/Professional) (suggested range: \$12-15/hour)	\$7928	2 Graduate students
INSTRUCTION (Teaching) - PHD STUDENT	\$	
POST-DOCTORAL OR STAFF EFFORT	\$	
UNDERGRADUATE STUDENT STIPEND OR WORK STUDY (suggested range: \$11-14/hour)	\$4600	2 work study students for administrative work (registering students, coordinating transportation, ordering food)
Supplies & Materials		
INSTRUCTIONAL, RESEARCH OR OFFICE SUPPLIES	\$2000	Supplies for workshop activities
COMPUTERS AND MINOR EQUIPMENT	\$	
Travel Expenses		
TRAVEL – DOMESTIC	\$	
TRAVEL – INTERNATIONAL	\$	
General Operating & Other Costs		
ADVERTISING AND PUBLICITY	\$ 200	Outreach to area schools (Handouts/flyers/social media)

Cost Category	Bass Connections Project Funding Request for 2018-2019	Notes (e.g., name of personnel, activities supported)
CONTRACT WORK	\$	
PUBLIC RELATIONS	\$	
MEETINGS – BUSINESS	\$	
OTHER – MISC.	\$2200	Lunch, snacks for students
TOTAL Bass Connections Request	\$16,928	
<p>Other Sources of Project Funds (Projects that leverage or match funds are strongly encouraged and these funds —both awarded and currently proposed —should be noted so that we understand the comprehensive outlay for the project)</p>		
<p>[Source #1] Chair of the X Department, has agreed that the department will fund 25% of the total cost of this project.</p>		
<p>[Source #2] Chair of the Y Department, has agreed that the department will fund 25% of the total cost of this project.</p>		
<p>Your Unit/Business Manager who could administer funds for project, if requested: NAME, EMAIL, Department Grants & Contracts Administrator NAME, EMAIL, Department Business Manager</p>		