Form 1: @Scale Narrative Template and Instructions

I. Basic Information
    STEM Pathway Project

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II.   Goals and Objectives

The objective of the @Scale STEM Pathways Project (SSPP) at Massachusetts College of Liberal Arts (MCLA) is to increase the number of students graduating with STEM degrees. SSPP provides multifaceted opportunities for undergraduate students to excel in science and mathematics fields and prepare them to enter the workforce or to enroll in graduate programs. Indeed, our objectives directly address goal four of the Massachusetts STEM Plan 2.0[1]. That is to increase the percent of students completing postsecondary degrees or certificates in STEM subjects. Further, we sought to connect and share best practices with other institutions of higher education in Massachusetts, particularly in the state University system.

MCLA's Pathways Project provides strategic and successful initiatives, which address students' academic, experiential, and career awareness interests. The SSPP model compliments the work of the Berkshire STEM Network, and provides a nationally recognized academic support system, mentoring, experiential learning, as well as targeted faculty development. Our model is designed to be scalable and can be adopted to maximize enrolled students' interests and ultimate success, to prepare students for high demand STEM careers, and thus to contribute to the State's vibrant STEM economy.

MCLA's SSPP employs a STEM retention plan that includes activities and support mechanisms from freshman through senior year to increase graduation of STEM majors. The program highlights the importance of academic support, advising and career planning, and marshals the efforts of both Academic Affairs and Student Affairs divisions to promote student success through collaboration with STEM Programs, and the Center for Student Success and Engagement (CSSE) at MCLA. In brief the SSPP provides Supplemental Instruction support for students and includes the components listed below to increase postsecondary graduation and engage students with a full array of STEM partners. Funding from the @Scale initiative has directly supported a tutoring and mentoring program: Supplemental Instruction– components found at MCLA and nationally to be highly effective in supporting STEM student graduation. Over the duration of the grant the SI program has grown to reach more students enrolled in a variety of STEM courses. Other SSPP components have been supported by matching funds.

- Academic support to enhance student achievement – including a Supplemental Instruction program, STEM Associates tutoring sessions, mentoring, and technology enhanced academic advising and early warning system;
- STEM Scholarship: awards up to $20,000, over four years, to incoming STEM students (supported by the National Science Foundation).

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[1] http://www.mass.edu/stem/home/stemplan.asp

- Orientation sessions – including a First Days workshop with the STEM program manager, providing information about college STEM services and opportunities; academic departments open houses; STEM Academy for entering students (especially those from populations traditionally underrepresented in STEM fields) to prepare them for increased academic demands of college and opportunities to engage with local STEM partners.
- Academic programs that are innovative, service oriented and use an on-line learning management system – including a semester long one credit freshman seminar introducing students to the faculty and their background and opportunities for research, guest speakers and career opportunities in the sciences; classes employing the SENCER (science education for new civic engagement and responsibility; http://www.sencer.net/) model which strengthens student learning and interest in STEM by connecting course topics to issues of critical local, national, and global importance; service learning initiatives with STEM undergraduates working with local school districts to provide hands-on learning for K-12 students, and courses offered through the Canvas Learning Management System (LMS.)
- "30 by 3" program – a credit recovery program offering summer courses for students who did not earn sophomore status by the end of their second term;
- Undergraduate Research Program – faculty sponsored research to be presented at the MCLA undergraduate research conference as well as other regional and national conferences
- Internship experience – including job shadowing for freshmen and sophomores, and internships for juniors and seniors with local STEM partners

Many of the individual components of SSPP target specific times through a student's academic career. Supplemental Instruction (SI) threads throughout the individual programs as outlined in table 1. Supplemental Instruction is a nationally recognized academic support program developed in 1973 at the University of Missouri- Kansas City and has been endorsed by the United States Department of Education. SIs are upper class STEM students who provide drop-in sessions for STEM students in a majority of the required STEM courses. The tutoring sessions are offered throughout the week with a flexible support service to accommodate the complex needs of students. With funding from @Scale we have expanded the courses covered in STEM disciplines for the past 3 semesters. Our primary goals are to 1) increase the percent of students receiving high grades in foundational STEM courses, 2) provide career awareness and job seeking skills, and 3) convene discussions and workshops across institutes of higher education in Massachusetts.

Table 1: Overview of STEM Success Programs at MCLA

Year	Program Activity	Stakeholders	Outcome	Status
Freshman	First Days orientation session	Students and faculty	STEM awareness	Annual
	STEM department open houses	Students/STEM Programs	Faculty and student interaction STEM awareness	Annual
	STEM manager meetings Freshman Seminar	Students and STEM Manager Students	Career awareness	Biology seminar
	STEM Academy	Students/STEM partners	Academic preparation, career exploration	August 2013, 2014, 2015
	Career exploration local STEM partners	Students/STEM Partners	Experiential learning workforce development	Spring 2016
Sophomore	Career exploration local STEM partners	Students/STEM Partners	Career awareness and workforce development	Spring 2016
Junior	Undergraduate research conference STEM internships	Students/faculty	Research experience Career awareness; workforce development	Annual
Senior	Undergraduate research conference STEM internships	Students/faculty	Research experience Career awareness; workforce development	Annual

Increasing the percentage and success of STEM Majors

MCLA has seen an increase over all in STEM majors and those that are underrepresented in STEM disciplines and careers. Table 2 compares demographics of MCLA's undergraduate enrollment between 2008, 2012, 2013, 2014 and 2015 with enrollment of multicultural students doubling, and enrollment of students majoring in STEM increasing to the point that one-third of all MCLA students are majoring in a STEM discipline (* STEM majors include psychology majors).

Table 2   MCLA Student Demographics Program

	2008	2012	2013	2014	2015
Underrepresented Students	9.7%	17%	20%	22%	22%
Women	59%	59%	61%	62%	63%
Percent STEM Majors	20%	31%	34%	33%	33%

Additionally to the growth of STEM majors and the changing demographics of the MCLA community we also see an increased performance of students enrolled in the introductory courses. Also, students who are hired as SIs report **qualitative enrichment** of their own academic experience and changing their own perspectives on learning and success. The following quotes indicate the high degree of metacognition that SIs experience by engaging in their role.

"I became more conscious of my own study habits and the amount of effort I put into my classes"

"I feel that helping others learn something is a great way to remember it yourself."

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Indirect impact on other STEM Goals.

The @Scale funding enables us to directly address **Goal 4:** increasing post-secondary degrees in STEM fields. We have recognized that another goal **indirectly addressed is Goal 3:** *Increasing the percentage of skilled educators who teach PreK-16 STEM*. While obtaining this goal is a long-term pursuit, we feel that by providing the STEM tutors with training and teaching opportunities we may influence their teaching skills and possibly their interest in STEM education. Many graduate programs in the sciences lack teacher training for their students. By providing approaches to developing and implementing lesson plans, our tutors have advanced their understanding of pedagogy. Further, faculty members who work with SIs have reported benefits to their own teaching practice. This includes reflecting on teaching methods and content delivery. For example, some faculty members report the value of debriefing with the SI in order to understand the students understanding of topics and course materials. Also, one faculty reported making use of the SI during class time to demonstrate academic skills such as note taking.

III.   Implementation

Our goal is for 100% of the STEM majors to participate in at least one component of SSPP. Table 1 details the various initiatives of SSPP, the dates of implementation. Since spring 2013, we have documented high level of participation; however the challenge remains to reach all students, particularly those who are at risk of low academic achievement.

Since 2013, the STEM Academy has worked with 48 students in addition to student leaders and staff. The summer Academy has become a feeder for our SI program. For example, each fall SIs are assigned to introductory courses, to support all students, which include the summer Academy participants. In subsequent years, the Academy alums have become SI leaders, in part due to the early exposure to the peer leaders, and their own academic success. The utilization of both SIs by

enrolled students has continued to increase since spring 2013. We continue to assess the academic impact this program has on the students who utilized the tutors.

As of Fall 2015, we employed eleven Supplemental Instructors in a variety of STEM courses and have monitored the impact in the individual courses they were assigned. Overall, summary of all courses shows a slight increase in the success of students who utilized the SIs (82% percent of students received a grade of A, B, or C) over those who did not attend the sessions (80% received an A, B or C). However, this view masks some important variation that occurs within individual courses. For example, in our Math for Liberal Arts course, the average GPA for students that attended SI sessions was 3.00 and those who did not, their GPA was 2.7. This is a significant improvement. On the other hand students enrolled in introductory Chemistry course did not experience a similar trend this fall. However, this course saw greater usage of the SI resource, so it is likely that a higher level of at-risk students were utilizing the SI sessions. We continue to analyze the data.

While @Scale funds have supported the SSPP tutoring programs for over a year, it is difficult at this point to fully report the quantitative analyses. We are challenged by the small sample sizes and the accurate depiction of the impact of the program. Further, we have found that comparison between the same course of different semesters is a challenge since the academic skills of each group of students can vary drastically. We have continued to discuss the merits of mandatory attendance at the SI sessions. However, the precise way of implementing mandatory attendance, if at all, has not been determined. MCLA has been instrumental in convening a group of faculty and staff representatives from the State University system to discuss models of peer learning. Through these discussions and workshops we have analyzed similar models of peer learning that require attendance and have made the tutorial a part of the course, and to those that are similar to our voluntary model.

Other funding sources support various components of the SSPP program, as well as in-kind contributions. These other components of SSPP often occur in very specific ways and at particular times of year, or within certain times of a student's academic career. The SI program is unique in that it serves as the common thread throughout the four-year success plan.

IV.   Scale

Internally, we have expanded the SI program to include more courses, thereby serving more students. Within Massachusetts we continue our work with the other state universities. Specifically, since 2013, we have increased the number of courses that have SIs. This means that the SI program reaches more students, employs more SIs, and works with an increased number of faculty members.

MCLA has extensive experience in providing high quality STEM programs as demonstrated by more than a 50% increase in overall STEM student enrollment compared to 2008. This growth is attributable to some of the following components, readily available for expansion:

- Supplemental Instruction coupled with STEM Associate drop-in sessions to provide additional student mentoring and support;
- Academic programs that are innovative, service oriented STEM programs using an online learning management system, providing ready access and models for expansion;
- An undergraduate research program which promotes student discovery learning and supports student participation in campus and regional conferences;
- STEM Scholarships for low-income students to help with the cost of college.

V. Outputs, Outcomes, & Evaluation

Student enrollment in STEM majors has increased over the years to around one third of the entering class (STEM majors includes psychology). Commensurately, the percentage of MCLA students matriculating in a STEM major in fall 2015 is 33% compared to 20% in 2008. While many factors can result in this increase, many prospective students are informed of the SI and peer-learners supported by @Scale. We have also seen an increase in the number of STEM majors graduating from MCLA.

Supplemental Instruction is a researched-based model of academic support designed for implementation with high risk/difficult courses. It has been endorsed by U.S Department of Education for its effectiveness. MCLA – under the @ scale project - has linked STEM courses with SIs. Junior and senior level students are hired as STEM Associates. They held drop-in sessions to support students' mastery of course content, laboratory report completion, and examination preparation. In AY 2011-2012, 85% of participating students' earned final STEM grades in the C range or above with 90% of participating students indicating that they would recommend either SI or STEM Associate sessions to their friends. Data from 2014-2015 academic year is still being collected and analyzed at this time however preliminary results suggest that 81% of students attending SI sessions receive grades at a C or above. As mentioned previously many students utilizing the SI and SA report positive impacts on their academic performance. Therefore, the evidence suggests that the SI program benefits the academic experience in multiple ways:
1) increase in student performance, 2) leadership and academic skill development for SIs, and
3) benefits to the faculty in regards to their teaching practice and philosophies.

VI. Budget & Plans for Program Sustainability (see separate attachment)

Form 1a: Expenditure Worksheet

Please complete the expenditure worksheet below. In the first column, identify how you divided your grant among the identified expense categories. In the second column, list your expenditures to date. The third column will automatically populate with the difference (remaining balance). Make sure to sign and date this worksheet before submission and include any necessary explanations or comments in the "Comments Box".

Instructions: Double-Click on the table for it to become an interactive spreadsheet. Click outside the table to return to MS Word. <u>ONLY FILL IN CELLS HIGHLIGHTED IN YELLOW: Non-Yellow cells contain formulas and will fill in automatically.</u> Also, all cells are formatted for currency; you do not need to type in $ signs.

Categories	Grant Funds Received		
	Grant Funds Received	Grant Funds Expended	Grant Funds Remaining
Total Salaries:	$ 68,000	$ 24,547	$ 43,453
Administrator	$ 28,000	$ 11,712	$ 16,288
Support Staff	$ 30,000	$ 9,335	$ 20,665
Other	$ 10,000	$ 3,500	$ 6,500
Fringe Benefits			$ -
Contractual Services			$ -
Travel/Transporation	$ 2,000	$ 478	$ 1,522
Total Supplies & Materials:	$ 3,000	$ 232	$ 2,768
Curriculum	$ 3,000	$ 232	$ 2,768
Equipment			$ -
Other			$ -
Training			$ -
Tuition & Stipends			$ -
Evaluation	$ 2,000		$ 2,000
Other (Identify)			$ -
Other (Identify)			$ -
Indirect Costs (10% Max)			$ -
Total	**$ 75,000**	**$ 25,258**	**$ 49,742**

Project Name/Organization: Massachusetts College of Liberal Arts

Project Manager: _Monica Joslin_   **Date: February 5, 2016**

Comments Box

The total in the column "Grant Fund" remaining does not include "encumbered" in the

amount of $ 13,813, which leaves a balance of $ 35,929 for spring 2016 academic semester.

The @ scale funding budget will cover spring 2016 (see below estimated budget)

Staffing …………………………………………………$ 8,000

STEM career exploration events ………..$ 10,000

10 Faculty @ $ 500…………………………… .$ 5,000

10 students @ $ 800 …………………………$ 8,000

Evaluation ………………………………………………$ 2,000

Material ………………………………………… $ 3,000