

# The Future of Inclusive STEM Education & Studies at Lafayette College

*Co-Conveners:*

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## 1. Executive Summary

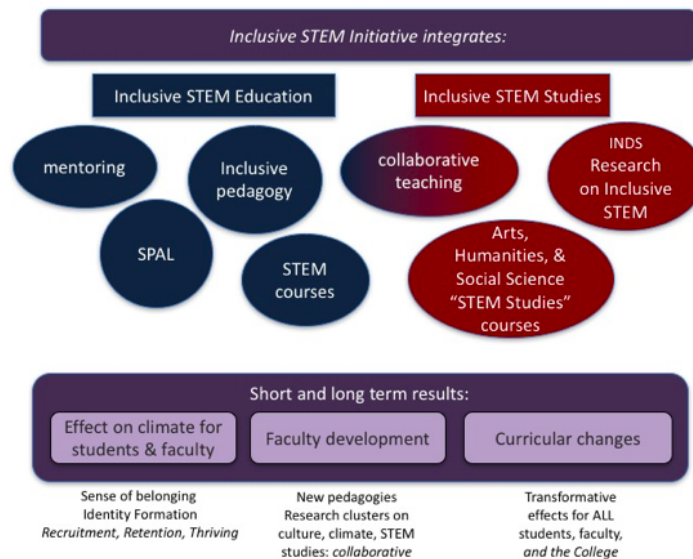
Our vision of the Inclusive STEM Initiative involves making STEM programs, classrooms, and cultures more inclusive—supporting the recruitment, retention, and thriving of students from all backgrounds—as well as fostering cross-College and interdisciplinary work related to STEM programs, culture, and socio-cultural content. Lafayette has the potential to transform itself as an institution by developing new knowledge related to inclusive STEM and by putting that knowledge into effective practice.

Lafayette is uniquely positioned both to demonstrate excellence in inclusive STEM pedagogies and be a leader in the broader field of STEM studies. (STEM studies involves research and teaching that focuses the (inter)disciplinary lenses of sociology, history, women's & gender studies, philosophy, ethnic studies and other fields on the cultures, practices, methods and products of STEM.) STEM Studies at Lafayette could include interdisciplinary faculty-led research focused on fostering inclusive cultures on campus, as well as STEM studies courses that offer opportunities for critical thinking and engagement across multiple disciplines.

In several discussions with engaged faculty colleagues, we have noted the importance of students' identity formation as “doers of STEM” within the culture of STEM. Faculty noted how classrooms, projects, and collaborative peer teams/study groups all contribute to a disciplinary community/culture/climate that powerfully affects students' “ability to see themselves in STEM” and shapes their sense of belonging and desire to contribute. Psychology, sociology, and other disciplines can empower faculty and students to understand these dynamics of STEM cultures and how they are built and maintained. These associated fields can help students understand how culture impacts their own identity development. Through cross-disciplinary collaborations, we want students and faculty to see and take responsibility for their own role in building and changing/maintaining this culture.

By coordinating efforts in both STEM education and STEM studies, it may be possible to achieve interdisciplinary, collaborative, and broadly transformative institutional change, with positive effects on the recruitment, retention, and potential for thriving of diverse students and faculty, and development of new knowledge about STEM culture and practices, practitioners, products, and interaction with society.

This report describes some of Lafayette's current strengths, programs elsewhere whose achievements we admire, and recommendations for Lafayette to leverage its unique potential for leadership in this area to achieve transformational change that aligns with the College's strategic priorities in *diversity and inclusion* as well as *interdisciplinary, integrative collaboration*.



The figure above illustrates the integration of “STEM Education” activities focused on the inclusive excellence of all students in STEM with “STEM Studies” activities that contextualize and critique STEM practices and products, and help students understand the “culture of STEM” and their potential place within it.

The recommendations detailed in this report fall into the following 4 categories:

1. Additional expertise in STEM Education: a permanent staff and/or faculty member whose charge centers in the facilitation and broader development of inclusive pedagogies in STEM. This specialist would have substantive expertise in the academic research and associated practices connected with the field of STEM Education. This expert would be able to disseminate and deploy best practices for inclusive STEM pedagogies.
2. Additional expertise in STEM Studies: a “cluster hire” of faculty in fields across the institution, enabling both breadth of approach and synergy. Coordinated hiring of these faculty over the span of one or two years will strengthen the overall impact of an Inclusive STEM effort. Importantly, it also will reduce the frequent isolation and often heavy workload of faculty purposefully hired to build bridges (both pedagogical and curricular) and to take the lead in “diversity work.”
3. Support and Coordination for Collaboration: Many current experts “live” in many different places on campus (have different primary research foci), but require support and structure for connection and collaboration. The College should support *research groups* (with both current and new faculty) focused on Inclusive STEM and transforming STEM cultures.
4. Inventory of Current Activities, Coordination via a Task Force  
This report describes many successful examples of courses, programs, and other efforts at Lafayette. A comprehensive inventory will ensure the sustainability and coordination of these efforts going forward. We support implementing the planned campus climate survey in order to gain valuable, actionable data, and we suggest that outside consultants may help facilitate “best practices” expeditiously. We recommend a Task Force of faculty leaders and directors of relevant centers (including CITLS and the anticipated Hanson Center) to coordinate efforts.

*With these 4 interconnected recommendations, we propose to leverage Lafayette’s unusual institutional structure, mobilize current/emergent interests, and employ new human and support resources to advance key College priorities in ways that are fundamentally transformative. We anticipate the impacts of this initiative (including curricular and research developments) will positively affect student & faculty success, support diversity and inclusivity in STEM and beyond, and model successful integrative interdisciplinary collaboration at the College.*

## 2. Vision for Inclusive STEM Initiatives at Lafayette

Our vision for Inclusive STEM at Lafayette leverages current and emergent institutional efforts to cultivate diverse and inclusive STEM and STEM-related learning environments for students and faculty in order to: 1) maximize all students' and faculty potential for success in STEM subjects; 2) facilitate the cross-curricular study of STEM fields in ways that address their social and cultural significance, especially relative to social justice; and 3) transform the institution through collaborative work.

By intentionally focusing on this broad vision of “Inclusive STEM,” Lafayette can mobilize and coordinate existing efforts, bring new expertise to campus, promote inclusive excellence broadly, foster sustained interdisciplinary collaborations in and around STEM, and authentically integrate STEM and liberal arts knowledge and perspectives.

As one of a handful of liberal arts colleges with both an array of strong natural science programs and robust, discipline-specific engineering programs, Lafayette is uniquely positioned to *both* demonstrate excellence in inclusive STEM pedagogies<sup>1</sup> *and* be a leader in the broader field of STEM studies. STEM studies involves research and teaching that focuses the (inter)disciplinary lenses of sociology, history, women's & gender studies, philosophy, anthropology, ethnic studies and other fields on the cultures, practices, methods and products of STEM.<sup>2</sup>

Lafayette has, at the most sophisticated level, the potential to transform itself as an institution by developing new knowledge related to inclusive STEM and by putting that knowledge into effective practice.

Our vision of the Inclusive STEM Initiative involves *making STEM programs, classrooms, and cultures more inclusive as well as fostering cross-College and interdisciplinary work related to STEM programs, culture, and socio-cultural content*. Examples of the latter could include faculty research focused on fostering inclusive STEM cultures and STEM studies courses (including the arts, humanities and social sciences, or “AHSS”) that offer opportunities for critical thinking and engagement across multiple disciplines.

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<sup>1</sup> “Inclusive pedagogy” refers to practices proven to maximize chances of academic success for students from diverse backgrounds, with diverse learning styles; these practices include but are not limited to active learning; hands-on, discovery-based, and project-based learning and experiences; mentorship; and workshop style courses and guided collaboration.

<sup>2</sup> The field of “Science, Technology, and Society,” originally “Science and Technology Studies,” embodies this approach of contextualizing, critiquing, and collaborating with STEM fields. E.g.: <https://hss.sas.upenn.edu/>, <http://sts.hks.harvard.edu/>, <https://sts.stanford.edu/>. Typically these are social science programs housed in colleges of arts & sciences, with the singular exception of UVA's program that is integrated into its college of engineering: <http://www.eands.virginia.edu/sts/>

By actively working to improve the demographic diversity in STEM at Lafayette and ensuring that the climate in STEM enables all students and faculty to flourish, we will achieve an important transformational change; by actively engaging faculty and expertise from the arts, humanities, and social sciences and promoting the study of STEM fields in their social, cultural, global and historical contexts, Lafayette can also elevate the Inclusive STEM effort by employing the critical thinking traditions from the liberal arts. *This intentional and innovative combination of efforts (STEM Education + STEM Studies) is a perfect fit for Lafayette as an institution and has the potential to position the College as a national leader in Inclusive STEM work.*

Initiatives focused on **Inclusive STEM Education** will help promote inclusive excellence and diversity by:

- Understanding and improving STEM teaching and learning **climates**;
- Supporting **STEM faculty development** to cultivate and maintain relevant best practices in inclusive pedagogies;
- Improving **demographics** of underrepresented groups and ensuring they thrive in STEM fields.

As Lafayette emphasizes the value of diversity in its student body and faculty, we must “expand access to and achievement in” STEM<sup>3</sup>. Institutional data indicate that retention and persistence are lower for students from under-represented groups in STEM fields at Lafayette.<sup>4</sup> A high priority for any inclusive STEM initiative must be the dissemination of best practices for inclusive pedagogy, so that faculty may effectively adapt their courses, classroom techniques, and curricula. By disseminating best practices and expecting faculty to employ inclusive pedagogical techniques (and recognizing/rewarding them when they do!), we can support success in STEM for all students.

Initiatives focused on **Inclusive STEM Studies** will help promote inclusive excellence and diversity by:

- **Fostering (STEM and non-STEM/AHSS<sup>5</sup>) faculty teaching** and research relative to inclusive STEM studies;
- Empowering active citizenship within **the culture of STEM**;
- Planning for the addition of **new faculty** with relevant expertise;
- Supporting **faculty research** on Lafayette’s climate and on broader institutional change;
- Developing **research groups or clusters** to coordinate focused, collaborative, institution-wide efforts.

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<sup>3</sup> This is the phrase used by the HHMI call for proposals in Inclusive Excellence, <https://www.hhmi.org/sites/default/files/Programs/Inclusive/Inclusive-Excellence-2018-Program-Announcement.pdf>

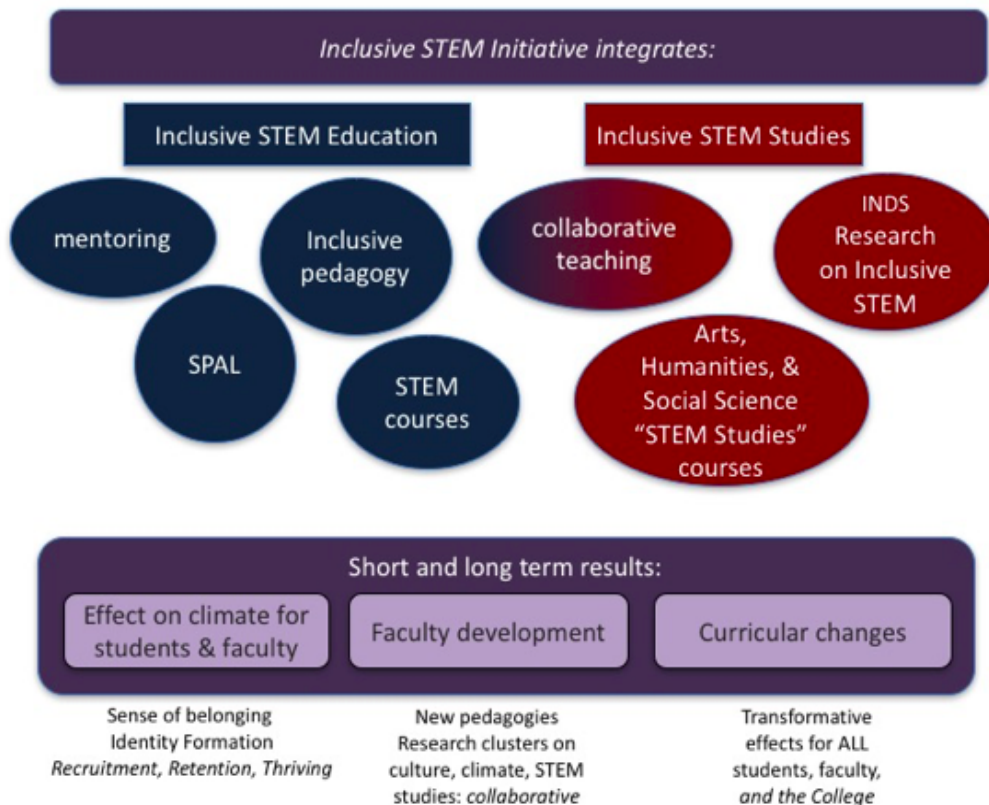
<sup>4</sup> This research was performed by Professor Mary Roth in support of the College’s ongoing HHMI project, and efforts to secure further HHMI funding. Her findings are discussed further in section 3 of this report.

<sup>5</sup> In this document, the S in STEM represents natural sciences; social sciences are included in the “AHSS” group of disciplines.

A notable benefit of “STEM Studies” is that it can inform institutional change by applying social science and other research on inclusive STEM culture. Through cross-disciplinary collaborations, we want students and faculty to see and take responsibility for their own role in building and changing/maintaining this culture. *By using new knowledge generated by College faculty research to guide decision-making and change at the College, we can enable institutional transformation based on credible research methods and local results, in effect marshaling this second category of efforts to help achieve the first.*

A coordinated College-wide investment in Inclusive STEM will include curricular enhancements (e.g., new classes in STEM fields and in STEM studies, open to all students) and promote a culture of interdisciplinary research and faculty collaboration that creates institutional platforms for inclusivity-centered teaching and learning across the arts, humanities, social sciences, natural science, and engineering. Hence, at the very broadest institutional level, Inclusive STEM Studies has the potential to help the College accomplish a long-standing but challenging goal: the development of authentic, meaningful and sustained connections between the liberal arts and engineering.

The figure below illustrates the integration of “STEM Education” activities focused on the inclusive excellence of all students in STEM with “STEM Studies” activities that contextualize and critique STEM practices and products, and help students understand the “culture of STEM” and their potential place within it.



### 3. Current state of “Inclusive STEM” at Lafayette

Lafayette is already distinguished by an array of initiatives that indicate widespread interest and expertise in STEM education and STEM studies. These include: achievement programs for STEM students from underrepresented groups, STEM-studies-focused academic programs and courses, grassroots support groups for both women STEM students and faculty, and multiple synergistic initiatives focused on inclusivity and supported by external funding.

The considerable breadth and quantity of these initiatives is strong evidence that—if backed by sufficient resources—the College can now move forward powerfully in advancing a sophisticated, cross-institutional “Inclusive STEM” agenda. Current examples of key initiatives include:

#### ***Summer Program to Advance Leadership (SPAL) in STEM***

Since 2009, founding director Professor Chawne Kimber has led the College’s Summer Program to Advance Leadership (SPAL) for incoming students from underrepresented backgrounds who have an interest in STEM majors. “Underrepresented groups” (URGs) are broadly defined and include gender, socioeconomic, ethnic, geographic, first-generation college, and other identities. The SPAL program (now supported by an endowment) provides these students with a six-week, intensive academic program. SPAL Students take a math course and writing course, participate in lab modules in the sciences and engineering, and visit local employers of scientists and engineers. They also meet College administrators, their class dean, other deans and staff, and many faculty members. Students begin career counseling, learn about study abroad, and connect to other academic opportunities available at Lafayette. SPAL has had a proven, positive impact on the retention and success of students from URGs.

#### ***Curriculum***

Numerous faculty, courses and programs Lafayette already directly support the goals of “Inclusive STEM Studies.” A quick survey across the College reveals nodes of curricular activity and innovation in STEM Studies. Taken together, they reveal a widely distributed interest in connecting STEM issues to the broader curriculum. They also strongly indicate the critical role that interdisciplinarity and cross-institutional collaborations play in enabling “nexus” moments in the curriculum that allow students to experience STEM Studies content. Project-based learning opportunities have been particularly prized by students on interdisciplinary collaborative teams.

Some current curricular examples are:

- **The Engineering Studies program** (chaired by Professor of Civil and Environmental Engineering Kristen Sanford Bernhardt). The EGRS Program leading to the AB in Engineering features an interdisciplinary curriculum that

includes contextualization of STEM content and critical analysis of STEM field history and content. EGRS courses enroll students from across the college.

- **WGS 250: Gender and STEM** (Prof. Mary Armstrong). Explores the intersections between STEM and stratified social systems, investigating how STEM field content and practice shape and are shaped by ideas/assumptions about gender, race and sexuality.
- **AMS/ES 252: Engineering America** (Prof. Jenn Rossmann) A culture/technology mashup highlighting interactions between technology and American society
- **AS 233: Anthropology of the City** (Professor Bill Bissell) Examination of urbanization and construction through the lens of anthropological inquiry
- **FYS 141: Mathematics of Social Justice** (Professor Rob Root). Application of math to social justice issues such as elections and income distribution.
- **Neuroscience** courses (Professor Elaine Reynolds) connecting Neuroscience to Art/Music, and **VAST 217: Art & Science of Flow Visualization** course (Professors Jenn Rossmann and Karina Skvirsky). These classes both interrogate and enable access to STEM methods and concepts.
- **HHMI-supported “infusion”** of other disciplines into Biology courses (modules), e.g., **Biology 101**

### ***Grassroots Mentoring/Community-Building***

The “active” state of interest in inclusive STEM at Lafayette is apparent in the emergence of new mentoring and community building initiatives around supporting women in STEM, as well as the presence of more established student groups:

- **Society of Women Engineers (SWE) and Women in Computing** are student groups that reflect student interest and engagement. These groups provide peer support, K-12 outreach, and sponsor activities that encourage student faculty interaction.
- **Women in the Sciences (WITS)**: is a new (2016) grassroots learning and support group for women students in the natural sciences. It was founded and is led by faculty members from the Chemistry and Physics Departments.
- **MINERVA: a faculty group for women in STEM** is a new (2016) grassroots faculty initiative that is led by a cross-disciplinary steering committee of women faculty from a variety of STEM fields.
- Multiple STEM majors have ongoing **student peer mentoring** programs.

### ***External Support: The Teagle Foundation, Howard Hughes Medical Institute (HHMI) and Clare Boothe Luce Research Scholars***

Originating from a **Teagle Foundation** grant, “Engaging Evidence: Program for Engaging Student Learning,” Lafayette launched two campus-wide projects focused on the implementation of diversity-related goals. The first, “Infusing Diversity throughout the Curriculum,” aimed to improve student learning regarding issues of identity and difference via curricular transformation. The project relied on a peer-to-peer faculty mentoring process aimed at developing new courses with substantive diversity content and employing inclusive pedagogy. The second,

student-centered project was entitled “Student Engagement in Critical Conversation about Social Justice Issues.” This initiated the campus-wide “Kaleidoscope” student peer-to-peer multicultural training program, which continues under the direction of the College’s Office of Intercultural Development.

The **HHMI-funded project**, Interdisciplinary and Process-Driven Biology Education to Prepare Undergraduates to be Leaders in Science Research and Medicine (2011-2016) aimed to encourage persistence in the sciences, particularly of students from URGs, through an apprentice-based, interdisciplinary research program in biology. During the multi-year initiative, the College sought to modify the biology curriculum to provide interdisciplinary, process-driven education<sup>6</sup>, and to expand and enhance undergraduate research with the **Science Horizons** program. During the program, faculty members mentored 78 first-year students in research over the January interim sessions and 20 rising sophomores during the summer. Science Horizons had a profound effect on retention in STEM: 90 percent of students in the first two cohorts declared a STEM major and 84 percent of students from the third cohort declared a STEM major, compared with less than 70 percent for the control group (students not in the Science Horizons program). During the four years prior to the Science Horizons program, only 13 summer research students in biology were from underrepresented groups. This number increased by more than 100 percent (28 students) during the HHMI-supported project. Another measure of success is national recognition; several Science Horizons students received honors, including one Goldwater scholarship and two Fulbright fellowships.

Within the engineering division, the **Clare Boothe Luce Research Scholars** program (begun in 2015) enables about a dozen women engineering students per year to be partnered with Lafayette faculty mentors to conduct summer research. Research has indicated that the opportunity to participate in research, especially early in their college careers, likely increases the persistence of women and other underrepresented groups in earning an engineering degree.

***Current HHMI Proposal (Submission in October 2017)***

Lafayette has been invited to reapply for further funding from the HHMI and is currently in the process of doing so. As part of this second HHMI proposal and in support of a sequence of HHMI proposals and HHMI-funded projects, Professor Mary Roth (CEE) has performed significant analyses of data on retention and persistence of students in STEM at Lafayette. Roth identified three important factors related to the observed persistence gap for under-represented students in the natural sciences. Those factors included:

1. Insufficient opportunities for students from under-represented groups to participate in and benefit from mentoring opportunities, which build their sense of self-efficacy and identity as scientists.

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<sup>6</sup> E.g. integrating the methods of discovery-based learning known as “Sea-PHAGES,” <https://seaphages.org/>



2. Insufficient faculty knowledge, time, and support necessary to understand, develop, and implement an evidence-based pedagogical approach.
3. Gaps in the high school preparation of students from under-represented groups.

The collaborative process of applying for further HHMI funding, and the work of Professor Roth in particular, has strengthened local knowledge around retaining URG students, broadened cross-disciplinary collaborations around inclusive STEM, and further readied the campus for work in this area.

We note the breadth and variety of these current practices, the support they have garnered from both internal and external sources, and their resonance with the College's strategic initiatives (growth, increasing diversity, and supporting the success of all students). Together they provide verification that there is strong institutional interest in and commitment to this area of focus. They also indicate that we now have an opportunity to leverage this existing commitment into something larger and transformative, and to more effectively involve greater numbers of students and faculty in a more intentional and coordinated way.

#### **4. Discussion of “Inclusive STEM” at other institutions**

While there are programs we particularly admire at other institutions, there are very few that have achieved the coherence, breadth, and institutional transformation we hope will be possible at Lafayette with a focus on both inclusive STEM education and studies, as well as on their interaction. If Lafayette made a commitment to the type of initiative described in this report, it would be a uniquely strong, pioneering and innovative enterprise.

We note a few exceptional examples of “Inclusive STEM” and “STEM Studies” that would be aspirational models for our efforts. Georgia Tech's Center for the Study of Women, Science, & Technology (<https://wst.gatech.edu/>) supports both collaborative WGS research and mentoring of female students in STEM fields. Its mission is to “bring together faculty and students to address issues of gender, science, and technology in research and programmatic initiatives.” We can imagine broadening this approach beyond gender to include other “underrepresented groups” at Lafayette. Another admirable feature of Georgia Tech's programs is the full integration of STEM education expertise within its STEM departments, including a “CS Education” subgroup of faculty in the CS program; these faculty members' charge includes sharing their expertise in pedagogy and assessment with STEM faculty. The University of Virginia's exemplary Engineering and Society program is well known for its leadership in STS scholarship, and its extraordinary contribution to the education of UVA engineers. While we would love for all Lafayette STEM students to benefit from the contextualization and critique enabled by STEM studies, we believe such courses and programs will also have a positive impact on students *outside* STEM fields. We also admire Amherst College's “Being Human in STEM”

project (<http://www.beinghumaninstem.com/>) which grew out of a research project-based course experience including interviews of STEM students, faculty, staff, and alumni; the collaborative project at Amherst has since been adopted at Yale as well. We learned of another example quite recently, as one of our newest colleagues at Lafayette participated as a grad student in Northwestern's "'Academy for Future Science Faculty" at Northwestern, in which biomedical scientists are "coached" by social scientist mentors in ways that help "students explore and define their career goals and science identity."<sup>7</sup>

More often, "Inclusive STEM" at other institutions has a much more narrow meaning than what we have envisioned at Lafayette, with STEM students from under-represented groups their primary stakeholders and principal beneficiaries. A few examples of strong but narrow programs are the Tufts University Center for STEM Diversity (<http://stemdiversity.tufts.edu/about>), and Smith College's "Achieving Excellence in Mathematics, Engineering, and Sciences" (<https://www.smith.edu/aemes/>). While these centers provide services and support that we would wish to emulate at Lafayette, we believe we can do *more* by involving faculty and STEM Studies research & teaching in our efforts.

## 5. Recommendations

*The recommendations made here must be considered relative to the significant similarly-themed work concurrently taking place at the College. This includes both various grassroots and formal inclusive STEM-related initiatives, with particular emphasis on: the evolving proposal for the HHMI grant, developing plans for the future Hanson Center for Inclusive STEM, and planning activities around the future of CITLS. Ongoing consideration of links among all these initiatives and entities (small and large) will be critical to keeping the Inclusive STEM initiative focused, efficient, responsive and "more than the sum its parts. "*

**1.** Through our discussions with faculty interested in Inclusive STEM, we have confirmed that there is strong STEM faculty interest in Inclusive STEM Education, and in building institutional capacity for sustaining an inclusive climate in STEM classrooms, labs, and culture. Many STEM faculty keenly feel a lack of personal expertise and of institutional support for pedagogical development around inclusivity. *Therefore:*

**Recommendation 1 (Inclusive STEM Education):** We should bolster the current expertise on Inclusive STEM on campus with additional support for faculty development, by means of a **permanent staff and/or faculty member whose charge includes the facilitation of inclusive pedagogies in STEM.** This includes

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<sup>7</sup> Thakore et al. BMC Medical Education 2014, 14:160, <http://www.biomedcentral.com/1472-6920/14/160>

the possibility of faculty with expertise in science and/or engineering education. We emphasize that the College should have the will to hire and enable the success of any faculty member whose expertise it wants and needs.

We believe the collaborative and cooperative Teagle model of faculty development will be relevant to disseminating best practices among Lafayette STEM faculty, and for creating a network of supportive fellow travelers. The Teagle faculty group was based on faculty peer-to-peer mentoring that grew in “concentric circles,” saw faculty participants as “change agents,” and was linked to the administration by communicative partnership.

**2.** We believe it is critical to create a robust curriculum in which STEM areas and themes are studied in their social context across the liberal arts and in which issues of difference and diversity in STEM content and practice are strongly emphasized. Hence, we must bolster the presence of such topics in the curriculum. This includes adding STEM studies content around gender, race, sexuality, social class, global and transnational differences and other markers of identity by offering courses/other student learning experiences in these areas consistently and frequently. *Therefore:*

**Recommendation 2 (Inclusive STEM Studies):** Thoughtfully planned **faculty hires in inclusive STEM studies areas** in coordination with CITLS and the planned Hanson Center are needed to make a shift towards consistent and substantive curricular content in these areas. **We believe that a cluster of 4 or more faculty lines--planned intentionally and coordinated both in relation to each other and to the larger goals of Inclusive STEM--would have a profound impact on the curriculum and the College.** It is crucial that these lines be distributed and developed with the cooperation of the hiring dept/program and actively understood as part of the broader “Inclusive STEM Studies” hiring cluster. We believe that interdisciplinary programs are particularly strong, natural fits for such hires. Among the most likely homes for such lines are the Engineering Studies Program, Anthropology & Sociology, and fields with global/transnational/area studies foci. Coordination among the hiring departments and programs will be essential to ensure the cluster’s breadth and effectiveness, and to identify, anticipate, and overcome structural obstacles to their individual and collaborative work on campus.

**3.** We believe an effective initiative in Inclusive STEM Studies should support *research in a small, focused number of faculty clusters* or groups, orchestrating the efforts of faculty who have expertise in gender/diversity and interdisciplinary STEM studies around specific areas of coordinated inquiry. Clusters might have “concept”-level STEM themes, such as cross-disciplinary explorations around Difference, Coding, and Design or focus on thematic areas around STEM diversity, like white privilege, chilly climate, creating allies. Research themes might be developed to coordinate with incoming hires’ areas of focus to maximize the institutional effect of “cluster hires.” *Hence:*

**Recommendation 3: Shaping Broader Institutional Transformation through Structured Interdisciplinary Collaboration and Research:**

Faculty research clusters would *intentionally link their work to supporting positive climate change at Lafayette* and *also strive to support a more cooperative faculty culture as they move forward*. Clusters would purposefully aspire to three things:

- 1) the production of new knowledge in STEM and STEM diversity studies;
  - 2) using that knowledge to foster climate change around gender/diversity in STEM at Lafayette; and
  - 3) actively fostering a more cross-divisional, cooperative faculty culture on campus.
- Structural similarities to the Teagle faculty group are intentional.

**4.** The three recommendations above address three areas: STEM education, STEM studies across the curriculum, and using focused faculty research clusters to create institutional change. Our fourth recommendation addresses the key issues of 1) how to make informed decisions that reflect the specific needs and strengths of the College across these three areas and 2) how we might educate and prepare ourselves as a community to embrace a broad Inclusive STEM agenda (including capturing perspectives from and facilitating involvement among all areas of the College). *Hence:*

**Recommendation 4 (Inventory and Task Force):**

To guide decisions about what kinds of STEM education and faculty expertise/hires are most needed, we recommend the development (and eventual distribution) of an **Inclusive STEM inventory** of faculty teaching and research expertise (courses, publications, professional interests). This scan will also enable the College to plan events and speakers.

Relatedly, we also recommend the creation of an institution-wide **Inclusive STEM Task Force** that includes representatives and leaders from current and emergent inclusive STEM initiatives. Developing a culture of communication, faculty buy-in and coordination around Inclusive STEM will be critical for ensuring the efficient use of faculty time as well as success.

The Task Force would also work to steer and integrate the proposed, newly endowed Hanson Center for Inclusive STEM Excellence with other ongoing Inclusive STEM work. We believe the Hanson Center will support ongoing initiatives like SPAL, and also enable the new idea of research clusters in STEM Studies. We believe it will be a partner to CITLS, and that it, like CITLS, should be a College-wide resource (to be clear: CITLS supports all faculty; the Hanson Center is *not* “CITLS for STEM,” but a Center to coordinate climate, curricular, and research efforts as described in the recommendations above). We find a relevant example of such partnership at Tufts, which has both a university-wide Center for Excellence in Learning and Teaching, whose mission is faculty development, *and* a Center for STEM Diversity, whose focus is student support (retention, climate). While we believe the Hanson Center will have a larger mission than Tufts’ Center for STEM Diversity, this mission is complementary to that of Lafayette’s CITLS. CITLS and the

Hanson Center are mutually supporting partners in the translation of the new knowledge generated by STEM Studies research to faculty development, curricular transformation, and an inclusive climate for students and faculty. We anticipate that the mission of the Hanson Center will be to coordinate student support initiatives (like SPAL) and to facilitate STEM Studies research at the College, fostering collaboration among the proposed research clusters, and to partner with CITLS to disseminate best practices and inclusive pedagogies.

Part of the work of the Task Force should also be focused on addressing **predictable issues and hurdles**. None of our conversations has failed to include discussion of the obstacles to this work, including:

--Us vs. them We lament the stubborn persistence of “two culture” type thinking and a lack of respect for other disciplines’ expertise, reinforced by arguments about the “return on investment” or “usefulness” of certain types of learning. This is a major obstacle to true faculty partnerships and to students’ interdisciplinary learning, as well as an obstacle to integrating diversity-related knowledge with STEM fields.

--Inclusive-STEM/Interdisciplinary Leadership We see the need for structured leadership in connecting those doing Inclusive STEM work. While the proposed task force will enable some coordination, we wonder whether this something leadership at the Director/Dean level might enable. (At Union College, a “Dean of Interdisciplinarity” position was the means by which such connections could be made & sustained.) Does our asymmetric leadership structure impede full cross-College communication & connection in this regard? What kind of structures and leadership are needed to create a culture of accountability and communication? How might the College organize a cluster of faculty hires? Could the Task Force contribute to MOUs?

--CITLS: The role of CITLS will be important, especially for STEM education. CITLS is a likely partner for the “translation” of research findings into practical deliverables like rethinking syllabi or advising projects. CITLS and Inclusive STEM are mutually supporting, as long as they are both strong.

## **6. Relation of recommendations to curriculum, research, community engagement, student/faculty/staff success, diversity/inclusion, interdisciplinary/integrative endeavor**

As described throughout this report, an Inclusive STEM Initiative will be an interdisciplinary/integrative endeavor centered on student/faculty success and diversity/inclusion, with support for research efforts and implications for the College curriculum across all disciplines.

## 7. Staffing and Resource Needs

This report details staffing and resources needs throughout, particularly in Section 5 (“Recommendations”). A brief summary of resources would be as follows:

### Inclusive STEM Education

#### **Staff or faculty hire focused on facilitating inclusive STEM pedagogies in STEM fields**

*This position is crucial now and also overlaps/connects with the vision for the future Hanson Center for inclusive STEM and to aspirations connected to the pending HHMI grant proposal.*

### Inclusive STEM Studies

#### **4 new faculty lines, designated as part of a planned “Inclusive STEM Studies” cluster hiring initiative**

*Lines would be specifically planned across inter/disciplinary areas and be formally linked to the Inclusive STEM initiative. Interested departments/programs can apply for lines by demonstrating the fit/appropriateness of hire in that area for Inclusive STEM scholarship and research. Cluster hires would be awarded with the understanding that hires would be formally connected to curricular and research initiatives associated with inclusive STEM. Specific cluster-related expectations for teaching and research focus could be managed with MOUs. Hiring departments and programs would coordinate their search processes and planning of MOUs to ensure that the cluster of new faculty worked in coordinated ways; this coordination is also intended to help identify, anticipate, and overcome structural obstacles to the collaborative and interdisciplinary work (both scholarly and curricular) that the cluster of new faculty would perform.*

### Institutional Transformation

**Support for “Best Practices” Expertise** including visits from change-makers at other institutions that have successfully undertaken similar initiatives across STEM ed and STEM Studies

**Salary/time for faculty leadership of Inclusive STEM** events, culture-building, and group organization as initiative builds up

**Salary/time for faculty leadership and participation** in developing and running research clusters focused on institutional change around Inclusive STEM issues.

## 8. Indicators of Success

Promotion of diversity in populations/across the institution, such as:

- Increased number of currently-underrepresented students retained, satisfied with climate, flourishing
- Increased number of currently-underrepresented faculty retained, flourishing

Promotion of curricular areas of focus and research on STEM inclusivity:

- Increased research output on our climate, methods, results
- Increased course offerings in STEM Studies, robust cross-divisional enrollments/increased student interest in such courses...potentially, integration into major requirements or development of a STEM Studies/STS minor

Promotion of a culture of cross-institutional collaboration and cooperation

- Consistent cross-divisional participation in related initiatives
- Increased and sustained inclusive-STEM-focused research projects, especially including faculty from both STEM and AHSS fields

The resources listed in section 7 are anticipated to lead to the successes in section 8 of this report. We are currently refining a “logic model” to illustrate this causality.

## 9. Timeline (by AY) and Goals

*Year 1:*

Inclusive STEM Task Force development and coordination of:

Inventory of current Inclusive STEM efforts

Inclusive STEM events on campus

Development of working plans for 1) search for STEM Ed specialist (coordinating with HHMI PIs as appropriate) and 2) distribution of STEM studies cluster hires

*Year 2:*

Coordinate/begin searches for first 2 hires from cluster

Additional workshops on inclusive pedagogies and STEM Studies

Inclusive pedagogies integrated into STEM classes

[Search for Hanson Center Director possibly underway?]

*Year 3:*

Hanson Center coming online/arrival of director. Revisit initial Inclusive STEM timeline in context of operational Hanson center.

Coordinate/begin searches for second 2 hires from cluster

Develop faculty research cluster with focused topic

*Year 4:*

Cluster of 4 new faculty hires complete

Faculty research cluster with focused topic begins “local” research in collaboration with the Hanson Center

Review of course-level and curricular changes

## 10. Appendices and References

### List of Contributors

We are very grateful to the more than thirty colleagues who contributed to ongoing conversations, participated in discussions—both those at the faculty retreats and those organized by the conveners, and expressed support for the vision and goals described in this report. They are, with apologies to any we've inadvertently omitted:

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In addition to the websites and programs described within this report, a selected set of relevant studies includes:

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<http://www.toolsforchangeinstem.org/> and

<http://www.uchastings.edu/news/articles/2015/01/doublejeopardy-report.pdf>