Appendix 2
The following provides a more in-depth view of the current status of Lyman Briggs College in the three areas of 1) the Briggs Curriculum, 2) the Briggs Experience, and 3) the Scholarship of Teaching and Learning. It was written as an appendix to the LBC Academic Program Review (APR) located at http://www.lymanbriggs.msu.edu/faculty/APR_summary_2012-4-11.pdf

The Briggs Curriculum
The LBC curriculum helps students build a core science foundation through courses in biology, chemistry, math, and physics before they focus on a specific major. The initial courses in these disciplines not only introduce field-specific concepts, theories, and methods but also demonstrate the inter-relation of various scientific disciplines: e.g., how chemical principles underpin biological processes or how mathematical models can make sense of physical behaviors. These courses help students understand the nature of scientific reasoning, evidence, and knowledge, and instructors strive to demonstrate the relevance of course material to real world issues. Students discuss course material with each other at a conceptual and theoretical level to deepen their understanding and then engage in science together to generate new knowledge through course-based research projects. These introductory science courses strive to provide students with a solid foundation upon which to build further understanding by utilizing research-validated teaching practices including active and collaborative learning. Class sizes are designed to be smaller than the typical equivalent CNS course and to provide a greater level of individual attention from the faculty members. Most exams are predominantly open-ended, giving students the opportunity to explain their understanding. The introductory laboratory courses intentionally employ inquiry-based experiments to help students to understand the process of science. These experiments focus on the methods of science and scientific argumentation and not on pre-existing “right” answers that students are seeking to confirm. The laboratory courses strive to help the students learn how scientists communicate their work through the development of the skills necessary to write journal style lab reports that illuminate the thought process and scientific reasoning skills of the students. Students also begin to learn scientific presentations skills through the creation and display of research-based scientific posters. This highly diverse range of pedagogies helps reach all types of students and engage them in learning the basic skills essential for all scientists.

To further strengthen their scientific education, the Briggs curriculum includes three courses in the history, philosophy, and sociology of science: an introduction to HPS course in their freshman year and two upper-level, substantive HPS courses in their junior and senior years. In their initial HPS course, students are introduced to key questions, concepts, theories, and methods in HPS. After this, students extend and apply their foundational HPS knowledge to more advanced courses in the diverse fields of HPS of science, technology, environment, and medicine. This cluster of courses aims to help students gain a more complete understanding of the fields of science in which they are gaining technical proficiency (e.g., learning about the history of physics in an HPS course while they are learning the science of electromagnetism in a physics course). In particular, students critically examine how scientists ask and answer research questions and develop theories and methods within and across disciplines over time.

Throughout these HPS courses, instructors manage student-centered classrooms in which students confront their prior knowledge and reflect upon how and why they know what they know. HPS instructors regularly use an array of active learning techniques that span from a single class meeting to an entire semester. Facilitated by the instructor, students engage with each other to discuss and apply the course material to real-world issues of importance. Students perform collaborative inquiry-based learning projects and engage with the local community through service learning, while honing their written and oral communication skills. After completing the cluster of HPS courses, not only should LBC graduates have a better historical, philosophical, and sociological understanding of science, but they should be more
capable intellectuals, have more marketable career skills, such as analytical reasoning and critical thinking, and be more empowered citizens prepared to be more active and effective participants in the public debates of the 21st century.

As they are completing their HPS coursework and their STEM-based coursework for their major, LBC students take their capstone senior seminar. This capstone experience—often an intensive, student-led, discussion-based course—formally integrates their STEM and HPS preparation and provides them with one last opportunity for independent inquiry during their Briggs experience.

The informal Briggs curriculum builds upon this formal curriculum. Briefly, the major elements of the informal curriculum are undergraduate research, study abroad programs, internships, participation in registered student organizations, the NSF-funded BRAID project, and the NSF-funded S-STEM seminars. We discuss the major elements of the informal curriculum in greater depth in APR section 3 on the Briggs Experience.

The Briggs Experience

The Briggs experience profoundly influences how students critically think about science and the world around them. More than just a set of classes, it involves engagement in a community of students, faculty, advisors, and staff and includes individual and shared educational experiences. This community participation does not end with graduation, but rather continues through a lifetime of interaction with classmates, faculty, staff, and alumni. Thus, the Briggs experience has a continuing influence on those associated with the program, leading most to strongly identify as “Briggsie.” These alumni then share their stories and help recruit prospective students to LBC to create future “Briggsies.”

A major aspect of the Briggs experience is the formal curriculum, which we discussed in APR section 2. Yet, the Briggs experience is much richer than just coursework. The residential college provides essential cohort-building experiences for LBC students. Housing the first-year students in a single residence hall provides opportunities for students to develop strong relationships with colleagues that will last throughout their entire MSU career and beyond. These students also get to know more senior LBC peers who are working as ULAs or still residing in Holmes Hall. Such ties help foster a sense of community as the older students share their experiences and knowledge with younger students. This type of cross-cohort mentorship, which has long been a staple in bench science laboratories, is integral to the Briggs experience.

LBC’s living-learning community has additional features that promote student engagement. The inclusion of the LBC classrooms, faculty, and student services within Holmes Hall is critical to the Briggs experience, facilitating out-of-the-classroom interaction between community members. These informal interactions humanize the faculty and staff in the minds of the students, which facilitates mentoring relationships. Significant discussions take place during class times, advising appointments, office and walk-in hours, as well as informally in hallways, the cafeteria, and elsewhere throughout Holmes Hall. Similarly, the proximity of faculty from different disciplines within Holmes Hall also has a profound impact on the faculty-faculty relationships. The informal interactions that arise among scholars in close proximity have led to many new teaching and research collaborations such as the Diversity in Science Senior Seminar developed by a historian, two biologists, and a social scientist. These collaborations then yield new educational and research opportunities for LBC students.

Many Briggs students participate in a wide range of co-curricular opportunities that help foster learning and engagement in the Briggs community and beyond. Such activities include the LBC Research Symposium, the class book debates, community service, and LBC Speaker Series as well as involvement in primarily LB student groups (Briggs Multiracial Alliance, Women in Science, MSU STEM Alliance, etc.). Students also take part in shaping the future of Lyman Briggs and MSU through their involvement in governance (they serve on all LBC standing committees and in many MSU student groups) and through their participation in the faculty hiring process.
Scholarship of Teaching and Learning

Nationally, 90% of students who leave the sciences cite bad teaching as one of the primary factors in their departure. However, research from the field of the Scholarship of Teaching and Learning (SoTL) has helped identify practices that can help us change these discouraging patterns. “High impact” teaching and learning strategies can greatly increase student retention in science majors. Unlike science faculty elsewhere, Lyman Briggs faculty have strongly embraced SoTL as a means for developing and engaging students in the culture of science. The Briggs curriculum, as discussed in APR section 2, consistently employs many of these high impact learning strategies. Student-centered learning practices are utilized in all classes. These include student-led discussions, inquiry driven laboratories, and active lectures with student response pads as a means of engaging students in making predictions and practicing newly learned skills. Our students increasingly recognize the benefit of these practices in their own learning.

Interdisciplinarity has been highlighted in many calls for reform of teaching and learning in science (PCAST’s Engage to Excel 2012 report, Boyer Commission Report on Undergraduate Education, the National Research Council’s BIO2010 Report, and Rising Above the Gathering Storm). LBC faculty members implement our integrated interdisciplinary curriculum using research-validated pedagogical techniques and technologies that make students active participants in the classroom. This setting has made LBC-based projects highly competitive for a variety of externally funded projects. One example is the NSF-funded BRAID project (Bringing Relationships Alive through Interdisciplinary Discourse) which has facilitated the implementation of interdisciplinary experiences for students throughout their introductory courses. The BRAID project has tested five different models for helping student make interdisciplinary connections in their classes and has induced many faculty to engage in serious discussions about science education. In addition to spawning the LBC Research Symposium and promoting interactions among faculty, the BRAID project currently supports two seminar courses each year focused explicitly on helping students make connections between the concepts in different courses. These seminar courses simultaneously provide an opportunity for faculty development. LBC also promotes undergraduate research experiences through faculty mentoring, competitive research grants, inquiry-based classroom labs, and an emphasis on the acquisition of science process skills.

The culture of SoTL runs much deeper than simply influencing the design and execution of LBC courses. As mentioned earlier in APR section 2.1, Briggs faculty now employ research-validated instruments to better assess and evaluate our own teaching. Briggs formally adopted the Student Assessment of Learning Gains (SALG) in 2011 as the primary means for collecting student feedback about their course experiences. This instrument asks students to evaluate their improvement on specific skills, abilities, or knowledge. This shifts the assessment of the classroom from “teaching” to “learning” and better addresses the key question about the efficacy of classes: what did students learn? Similarly, the faculty now employ the Reformed Teaching Observation Protocol (RTOP) to assess the kind of learning environment that an instructor fosters within the classroom. This instrument provides a resource for mentoring committees and strengthens a culture that openly discusses challenges in promoting student learning.

Further, many of the faculty members within Briggs have become active contributors to SoTL scholarship. The very nature of LBC means that it is an excellent laboratory for educational experiments. The students are highly engaged, they have close relationships with the faculty, they are a closed community where many students are taking the same classes, and the wide range of disciplines represented allow LBC to be a unique and, in many ways, ideal setting for SoTL research.