

Coupling Ethical Research to Community Engagement for Responsive and Impactful UG STEM Education:

The vision for STEM education at HBCU's from now and certainly until 2040 must be grounded in ethical principles focused on the responsible conduct of research, research that is community-based and engaged, serving underserved communities, and targeted at solving community problems. STEM students (especially HBCU STEM students) need to (continue) to understand that they stand on the shoulders of giants and they have an ethical and social responsibility to serve social justice. It is this, the principled discharge of the ethical responsibilities of universities to the communities that actually justify the Universities continuing existence. The STEM curriculum must be based on a comprehensive ethical platform for ethical STEM studies that follows W.E.B Du Bois' community-based vision of HBCUs' missions. The foundational structure on which this will be built centers around four program activities that should be required and *de rigueur* for all undergraduate STEM students. The first will define the very concept of responsible, ethical conduct of HBCU research through dedicated orientation programs and freshmen seminars for all incoming STEM students. The second establishes HBCUs' ethical responsibility for student retention and on-time graduation through group work. The proposal defines an ethical culture of group work modeled on successful near-peer tutoring programs, exemplars of this component already exist, such as at Xavier/ New Orleans and UMBC. The third builds on a case study model for collaborative student and faculty research on solutions to community and environmental problems such as lead in drinking water, micro-particle air pollution, and other problems under the heading of environmental racism and justice. The fourth enhances HBCUs' ethical cultures of undergraduate research through mentoring toward senior theses projects. The rationale is that this constellation of the four program activities will (1) increase the ethical STEM research output of Howard University undergraduates and (2) insure the broad ethical impact of that research on the under-resourced communities.

In terms of the broad goals, STEM education, now and certainly all the way to 2040 and beyond, such a structure to STEM undergraduate education will also address three desiderata for STEM education in 2040: an ethical culture of life-long learning for STEM alumni; STEM alumni ethics-based communities of learning that can help support life-long learning; and finally, broad support to enable STEM alumni communities of learning to expand their ethical conduct of research by engaging with under-resourced community members most urgently in need of their problem-solving skills. Du Bois' vision of the ethical, responsible conduct of research for HBCUs (and African universities by extension) justifies and underscores this approach.

Through the transformation of STEM curricula to align with the configuration proposed above, we would hope to see increases in the ethical research output of STEM undergraduates, and such curricular transformation will encourage universities to make case studies and senior theses and projects mandatory for STEM graduation. Through the stimulus for translating case studies and senior theses and projects into practical action, such an educational paradigm shift will enhance ethical commitment to underserved communities. STEM UG students will learn and imbibe self-reflection on their comprehensive ethical obligations as STEM students. Students in the STEM near-peer

tutoring programs will be motivated to take ethical responsibility for the success of their peers in STEM programs where peers are experiencing difficulty. Cohort STEM students engaged in ethics-based case studies research will acquire the potential to transfer their problem-solving skills to underserved communities. Faculty in the STEM ethics program will support student research culminating in senior theses and projects that will imbue STEM graduates with a “core value” of providing solutions to contemporary global problems, particularly ones impacting underserved communities.