Shifting Perceptions of Humanities in STEM Education

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An emphasis on STEM (Science, Technology, Engineering, and Mathematics) education can be seen in curricula for children as young as four years old. This is because a proper foundation in STEM education is essential for individuals to succeed in today's technology-focused world. In America and many other countries, the trend of STEM oriented curricula begins in primary and secondary education and continues through to institutions of higher learning. Institutions of higher learning have even seen a significant rise in enrollments in STEM related programs over the past decade. According to a report by the National Science Foundation (NSF), "enrollment in undergraduate STEM programs has increased by 43% since 2010, indicating a growing interest in STEM disciplines among students" (National Science Foundation Report, 2022). It is evident that there is concentrated growth and demand for professionals in STEM-related fields. However, this push for STEM education sometimes undermines the relevance and importance of humanities coursework.

Most institutions of higher learning strive to integrate humanities coursework within their STEM programs. This is accomplished by requiring all students, regardless of their chosen field of study, to take general education courses in focused areas such as communication, applied arts, and social sciences. However, despite these efforts to incorporate humanities into every student's learning experience, many STEM students dismiss these classes. These students often feel that humanities coursework is not directly applicable to their future careers in STEM fields. Humanities courses are sometimes viewed as easier and thus less valuable than more technical oriented courses. Many fail to see the contribution of humanities to critical thinking and problem-solving skills. This sentiment amongst students and society at large is articulated in an

article in The Washington Post, written by Valerie Strauss, who states that “many assert the primacy of the STEM fields, while for humanistic studies, politicians belittle them, parents urge their children to avoid them, and students choose them as majors less and less” (Strauss, 2017).

Institutions of higher learning must implement more strategies within their existing STEM programs to transform negative perceptions of humanities coursework. There must be a concerted effort to help STEM students understand the necessity for humanities education. These students must understand that they need humanities coursework in order to foster a holistic educational experience that helps them become well-rounded citizens of the world with a skill set that combines technical expertise with sound communication skills, cultural awareness, and ethical reasoning. By showing students entering STEM programs the benefits of humanities education, promoting interdisciplinary learning between STEM and humanities students, and integrating more equity focused coursework into existing humanities coursework, institutions of higher learning could potentially shift negative perceptions of humanities amongst STEM students and the general populace.

Regardless of their chosen major, by the time a college student reaches their third year of school, they have completed most of their general studies courses whose subjects intersect between a humanities and STEM focus. These are the classes that many STEM students bemoan and devalue, failing to realize that, as humanities advocate Lydia Edwards states, “humanities can be seen to nurture critical thinking by offering a grounding in ethics that, in turn, encourages a willingness in students to consider and evaluate multiple perspectives” (Edwards, 2022).

The first step that can be taken to change student's negative attitudes about humanities focused coursework is to fully detail the benefits of these courses to new incoming students entering STEM programs. These students may appreciate their humanities coursework more if they were able to recognize how much these courses will cross over into their future STEM careers.

Humanities courses like philosophy and ethics help students approach problems in different ways, which in turn aids in enhancing their critical thinking and problem-solving skills. During their first academic advising meeting, a student studying Computer Science could be given a simple brochure that details how a philosophy course will improve their ability to develop ethical algorithms. Algorithms are an inescapable phenomenon that affects every sector of our lives. With little to no regulation behind their creation and inner workings, they can be used for nefarious reasons. Empowering Computer Science students with knowledge of ethics and philosophy will lay a foundation for ethical innovation later in their careers, innovation that avoids malice intent.

Furthermore, when it comes to responsible technological development, humanities give STEM students a better understanding of the ethical considerations that correlate to their chosen fields. A future biomedical engineer would be more adept at handling the complexities of patient consent and privacy if they understood the benefits of an ethics class or learned through a history course about times in the past when such considerations were not taken. How about a future Software Engineer's ability to explain complex technical information to non-experts in a manner that is easy for them to understand? That student may not have success with this task if they are

unable to recognize the necessity of a language arts, public speaking, or literature course. STEM students must be presented with humanities coursework that correlates with their field of choice, but it isn't enough to simply require these courses through general studies. STEM students must also be taught the correlations between humanities and STEM coursework in a manner that helps them understand how each side complements the other. Orientations, academic advising, even syllabi should be rewritten to better detail these correlations.

In Vickie Spencer's article on the crisis in Humanities and its effect on democratic societies, the author amply states that "the humanities are not just important to democracies, but are a vital aspect of any society because they form a crucial part of human existence" (Spencer, 2014). No argument needs to be made about the need for collaboration in order to essentially be human. However, higher education rarely gives students opportunities to engage with one another in meaningful ways that affect each other's studies. Another way that higher education could help shift negative attitudes about humanities coursework amongst STEM students is through providing opportunities for interdisciplinary learning between students studying humanities and students studying STEM focused majors. This approach would likely reach beyond traditional academic boundaries, but it could be beneficial for students on both sides and potentially transform any negative perceptions that one may have for the other.

Collaborative projects could bridge this gap by combining technical skills with human-centered inquiry which could potentially demonstrate the value that humanities education has in solving real world problems. For example, a student studying history and a student studying

computer engineering could work on a mid semester project that requires them to develop technology that preserves a historical site. These students could combine their technical expertise with their understanding of historical events and culture to create something that is holistically human.

Another means for changing negative perspectives about humanities could be through interdisciplinary research. The average STEM focused class does not require students to write a paper or conduct research of any kind. This is a wasted opportunity, because if given the chance to conduct research that is interdisciplinary focused, STEM students could examine the intersections between subjects such as the social implications of scientific or technological advancement. Even an assignment as simple as encouraging students within an English composition class to conduct research that is specific to their major could open STEM students up towards discovering how various humanities hold significant weight in addressing how STEM related topics impact human life.

Institutions of higher learning can implement programs that encourage STEM and humanities students to develop mutual respect for each other's major of choice. These programs could consist of initiatives such as joint seminars and interdisciplinary course offerings that combine STEM subjects with humanities perspectives, all of which could have the power to interconnect knowledge to ensure that students on both sides have a well-rounded educational experience and develop complementary skills.

Many colleges already have diversity and inclusion programs embedded into their student life. There are also efforts to diversify many STEM fields that have been historically predominantly white. Another means to change negative perspectives of humanities coursework for STEM students is by incorporating the integration of already established diversity and inclusion initiatives with humanities and STEM programs. This would create a win-win scenario where places of higher education could cater to the needs of underrepresented populations within STEM fields while also promoting the importance of humanities.

As mentioned before, humanities provide students with opportunities to discover new perspectives. These different perspectives and experiences are crucial for a society that aims to promote inclusion, empathy, cultural understanding, and tolerance. Although technical fields may seem as though they only need professionals that are proficient in technical skills to be successful, they also need to be culturally aware in order to connect their STEM-related services and innovations to the people with whom they'll interact with. The human element must be present within STEM, and the best way to do this is to incorporate more humanities coursework into STEM programs.

Christine Reiter perfectly illustrates this sentiment in her paper about the importance of the humanities in the age of STEM by saying, “Studies in the sciences may teach our students how the human body functions or that for every action there is an equal and opposite reaction. However, the inhabitants of our global community and their reactions aren't always predictable. The Humanities—through literature, poetry, philosophy, and history—provide students with the

information needed to navigate the human experience" (Reiter, 2022). But how would this change negative perceptions around humanities?

Collaborative efforts of any kind are known to bring people together. As mentioned earlier, interdisciplinary studies amongst students in differing fields of study would be the best means for also promoting diversity and inclusion within STEM, which in turn can potentially change perspectives of humanities. A collaborative project that analyzes gender bias in AI and algorithms could greatly benefit a student studying computer science and a student studying gender studies. The humanities student could have the opportunity to engage with technical skills, and the STEM student would have the chance to use humanities to address societal issues such as equity in technology. Opportunities like this would have the power to break stereotypes about what is and what is not valuable knowledge and foster a learning environment that respects each student's intellectual capabilities, regardless of which discipline of study they may be following.

One concrete method that could create opportunities like this could be through a mentorship program that pairs upperclassman humanities students with lowerclassman STEM students and vice versa. Through this mentorship program, projects like the ones mentioned earlier could be established to promote collaboration amongst the varying fields of study, creating a two-for-one solution for promoting inclusion and equity that has the potential to shift preexisting negative perceptions towards the humanities. This approach could help all students become technically proficient and ethically centered professionals.

In order to change negative perspectives about humanities coursework amongst STEM students, several overhauls would need to take place. Institutions of higher learning would have to find a balance between interdisciplinary learning and technical training. STEM educators may need training in order to incorporate humanities-focused approaches into their coursework. Learning objectives from both STEM and humanities courses would need to blend with one another to create a cohesive learning experience, which in turn would lead to a need to loosen rigid technically focused curriculum within STEM programs.

Fostering interdisciplinary learning could not only change the perspectives of humanities amongst students preparing for STEM careers. It could also change the current societal ethos that currently values technical innovation at the expense of the needs and rights of living entities. Society cannot continue on the course of seeking innovation without understanding the human condition that is affected by technological advancement. This approach has led to numerous environmental and human rights disasters. Institutions of higher learning are at the forefront of combating this by producing graduates who are capable of technical innovation from a conscientious frame of mind. These graduates will be the individuals who can tackle some of the world's most pressing challenges, but in order to do so, these graduates must have an appreciation for both STEM and the humanities.

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