**Fall 2020 Master’s Theses**

Factors Affecting Science Instructors’, Science Undergraduate Students’, and
Non - Science Undergraduate Students’ Perceptions of Bioethical Decision Making

Ashley Lytle – MA Science Education/Biology

**Abstract**

Bioethics is important for a variety of fields and for a variety of reasons. There is renewed interest in bioethics and bioethical decision making, especially in STEM with the advent of new discoveries such as genetic engineering. By examining the possible factors and the participants’ reasoning behind their ethical decisions, bioethics educational courses or training can be customized to fill in knowledge gaps of both students and professors. This knowledge will also provide a more well-rounded thought process that includes understanding other viewpoints when making important bioethical decisions. The purpose of this study was to examine the factors and ethical approaches that affect bioethical decision-making in undergraduate students and STEM professors (physics, geology, geography, biology, chemistry) at a regional comprehensive university in the Southeastern U.S. A bioethical survey based on an international survey on bioethics by Macer was administered online to undergraduate students with a return rate of approximately 2%. Additionally, this survey was administered to STEM professors with a return rate of approximately 28%. Interviews were conducted from volunteers on the survey to determine possible ethical approaches to specific answers. The survey data was analyzed first using a series of two-way ANOVAS comparing participant type, gender, religion, ethnicity, and age. These findings were then further explored through an analysis of the interviews. Adjustments were made as necessary based on the interview data. It was found that participant type and gender were significant when making bioethical decisions. Ethical approaches yielded patterns with specific answers by revealing the common and uncommon reasoning processes. Additionally, experience with bioethics and bioscience topics positively correlated with acceptance or approval of bioethical scenarios such as genetic modification. These results revealed that experiences and demographics such as gender did affect attitudes and could be used to possibly predict decisions of certain populations, so awareness of these factors and alternative viewpoints are important to consider when discussing or teaching about bioethics. These findings validate that bioethics and bioethical decision making needs to be included across the educational spectrum.

*Keywords:* Bioethics, Ethics, University, Undergraduate, STEM

Greenhouse Study on Southern Highbush Blueberries in Soilless Media Amended with Biochar to Enhance Plant Growth and Mycorrhizal Fungi Colonization

Mariam Qambar – MA Science Education/Biology

**Abstract**

Amending soil with biochar, a highly porous and carbonaceous product of pyrolyzed organic material, has been found to improve blueberry growth. However, little work has been done to investigate the use of biochar as a component of soilless substrates for containerized blueberry production, a growing trend in the blueberry industry. Peat moss and perlite, two of the most commonly used components of soilless substrates, are not considered sustainable due to limited resources and high transportation costs. The purpose of this study was to determine if biochar can be a replacement for perlite and peat moss in containerized production of blueberry. A 12-week greenhouse study was conducted to evaluate the plant growth of two southern highbush blueberry cultivars (*Vaccinium darrowii*) ‘Jubilee’ and ‘Jewel’ in using locally sourced materials [green waste compost (C) and pine bark (Bk)] in conjunction with sphagnum peat moss (Pt), perlite (Pr), and biochar (B) produced from Douglas fir at 700° C . Substrate treatments were Bk30C30Pt30Bi10, Bk30C30Pt30Pr10, Bk40C40Bi20,Bk40C40Pt40Bi10Pr10, and Bk40C40Pt40 (percentages indicated as subscripts). Across treatments, Jewel had a higher total plant dry weight than Jubilee, 10.92 and 8.69 (g/plant) respectively. When plants grown in substrates Bk30C30Pt30Bi10 and Bk30C30Pt30Pr10 were on average 60% larger than plants grown in treatments without peat moss. The low pH of the peat moss (4.5) likely buffered the high pH of the compost (7.5), allowing for greater plant growth during the first half of the study. The soil solution pH of all treatments was well above the pH recommended for blueberry at the end of the study, an effect of the compost, which was a component of all substrate treatments. Soil solution analysis across weeks indicate that the biochar did not increase the pH more than the perlite, further proof that compost was the primarily driver of pH increase. The Leaf nutrient analysis revealed that all plants were low in nitrogen and phosphorous, likely a result of the higher pH values. No effect was found on mycorrhizal root colonization. Overall, biochar has potential to be a suitable replacement for perlite in containerized blueberry production when paired with low pH substrate materials such as peat moss. In this study, green waste compost did not appear to be a suitable component of substrates for containerized blueberry production.

*Keywords:* perlite, soil amendments, *Vaccinium darrowii*, indoor farming, plant
 nutrition