Reflective Essay

For the class Biological Systems Engineering Project II (BAE 231, 1 credit), an engineering design problem was given to several small groups that were tasked with researching and developing an innovative solution for the problem at hand. Each week throughout the semester, students learned a new step of the engineering design process including problem definition, design constraints, background research, idea generation, and design selection and evaluation. These design steps were used to develop a final engineering design report and a final presentation to report their findings and proposed design solution.

Our team was tasked with resolving an issue with a small pond in Palmer, KS. The owners of the pond, Bruce and Theresa Meyer, have been experiencing problems with blue-green algae due to eutrophication. This has prevented the pond from being used for recreational activities. Currently, their solution is temporary and uses chemicals to harden the water to remove the algae. The Meyers have requested a solution that offers a more permanent result while also being less expensive than the current chemical treatment.

Based off of background research, two design options proved to be effective in reducing the effects of eutrophication; vegetative buffer strips and a floating garden. Vegetative buffer strips are used to filter nutrients and sediment from runoff which will reduce the growth of the blue-green algae. A floating garden has the potential to provide an in-pond solution to reduce excess nutrients. This solution requires more maintenance and recurring costs. Well-planned buffer strips have a higher chance of providing a long term solution compared to the floating garden, which would have to be maintained and reinstalled yearly. The final proposed design used both designs in tandem. After further site analysis it was determined that rerouting the water through present vegetation at the location would act as a vegetative filter to reduce the amount of incoming pollutants and implementing the floating garden would work to remove excess nutrients that are already within the pond.

Hale Library itself is a tremendous resource for students at Kansas State University. The library has many areas where small groups can meet to work on projects together. This common area can be crucial to developing and strategizing projects. On several occasions our team utilized these common areas and the computers available to discuss and work on the project together. The common areas allowed team members to meet up and easily research topics, peer review each other's work, and edit final reports.

Since our problem had been defined by the clients' needs, the next step in the engineering design process was to create a literature review, which required background research of our topic. Eutrophication was a broad topic to research, so narrowing down our topic into smaller topics was the first step in researching the solution. Our team worked together to determine what aspects of eutrophication that seemed most relevant to our problem description. These sub-topics included the history of the Meyer's

pond and its location, causes of eutrophication, eutrophication in Kansas, blue green algae and its hazards, soil conditions, and environmental standards. After breaking our topic into manageable categories, each team member was able to select different sub-topics to individually research background information. After speaking with the clients and combining individual research into one literature review, the team was ready to look for possible solutions to the problem.

The library's database system and search engines allow for a quick and specific search of any research topic from recent and older publications that can be directly accessed. The database allows for access to a multitude of resources which can assist in fine-tuning a broad research topic. By using online resources, the risk for biased, untrustworthy, or inaccurate information increases. Thus, analyzing the source and type of publication (peer reviewed journal article, conference proceedings, etc.) becomes crucial in determining if the source can be considered reliable. The library's database proved to be invaluable for the team to locate relevant and accurate information regarding the project.

Resources outside of the library were also utilized. Multiple interviews were conducted with our clients to collect and relay information about the status of their property. A visit to the location of the pond was also arranged with the client to conduct a site analysis of the pond and surrounding area. Included in this site analysis, water samples were taken from various locations in the pond so that our team could perform tests on the chemical characteristics of the water. The site analysis also included an inventory of the surrounding area. This included a survey of the watershed encompassing the pond, as well as an assessment of possible local sources of pollution. Other online resources from trusted websites were used to gather information pertaining to governmental standards, prior design solutions, and geographical images/maps.

Collecting data from a multitude of sources also comes with managing references from all of the sources. Our team used Google Docs to manage our literature review documents and online team collaboration. RefWorks was utilized to help manage and compile a reference list. Our citations followed the guidelines established by the American Society of Agricultural and Biological Engineers (ASABE). Using set citation style allows for our references to be cited correctly and for other readers to access information from sources that our team utilized.

After compiling the information collected from the literature reviews, library resources, online resources, interviews, site analyses, and team collaborations, it was deduced that a design which utilizes the existing vegetation as a vegetative buffer and implements the floating garden design was the most viable and cost effective solution to resolve the Meyer's issue. While the project is only in the preliminary stages of development, it will serve as the foundation for a project that will be assigned to a senior engineering design team as part of a senior design class.