ARE POST-MILLENNIALS ENROLLED IN ENGINEERING MAJORS INCLINED TO BE SOCIALLY ACTIVE?

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Are Post-millennials enrolled in engineering majors inclined to be socially active?

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Abstract – **As part of a curriculum redesign for AY2009-10, university faculty and administration created a new course –Freshman Year Seminar– which is required of all incoming first year students. A service learning component is included as a part of the course. For FYS students in the College of Engineering, their freshman year seminar course includes the engineering design and construction of a service project which serves a community need and also takes advantage of their particular skill set. For AY2017-18, the faculty team broadened the idea of community to include the global community in response to a joint United Nations/Institute of Electrical and Electronic Engineers Humanitarian Technology Challenge Sustainable Development Goal for food security. The goal of this year's project was to produce a working model of a solar-powered food dehydrator which, theoretically, could be used to combat hunger in communities far removed from our local one. In principle, a dehydrator can extend the shelf life of food by preserving them for consumption at a later time, thereby addressing one aspect of the availability and accessibility of food. The feasibility of the idea was demonstrated in the current designs, while future iterations will stress the global aspect by restricting the designs to include only parts and components easily accessible in the local environment. Finally, using an end-of-semester survey we found that not only were engineering students enthusiastic about working as a member of a multidisciplinary team (69% of respondents agreed that participating on a multidisciplinary team was beneficial to their educational experience), but they also indicated a willingness to contribute their time and (future) money in support of social issues like global hunger.**

Index Terms - freshman year experience, global hunger, solar food dehydrator

INTRODUCTION

Gannon University –a private Catholic, Diocesan University in Erie, PA, and with a relatively new campus in Ruskin, FL– has a long and proud history of serving the community which it calls home. The campus is alive with many community service initiatives currently underway. For example, the St. Joseph House of Faith in Action is a new residential volunteer-supported construction which will eventually be a home base for volunteering and connecting in the community. The fundamental mission of St. Joseph House is to serve neighbors in the spirit and example of St. Joseph the Worker through programs and actions based on service, simplicity, community, and reflection. GU also directly supports several local community food banks by operating a vegetable garden –Gannon Goodwill Garden– on university property. The garden is maintained by university staff, many of whom volunteer their time. New garden initiatives have been supported by FYS engineering students for many years. Also, each semester the university coordinates GU Give Day during which students, faculty, and administrators spread out into surrounding neighborhoods taking on a variety of projects including leaf raking, house painting, and neighborhood cleanup. GU is active in other ways. Most recently, and in conjunction with several foundational community partners, the university is spearheading a multiyear effort to revitalize the adjoining West Bayfront neighborhoods. These neighborhoods contain over 4,500 structures used for housing, business, schools, and various organizations. In totality, the Our West Bayfront (OWB) project covers an 843 acre area and seeks to improve housing, enhance safety and security, and transform public spaces for the nearly 13,000 residents living within the OWB footprint. As exemplified, community service is a part of our identity.

As part of a curriculum redesign for AY 2009-10, university faculty and administration created a new course – Freshman Year Seminar– which is required of all incoming first year students. A service learning component is included as a part of the course. For FYS students in the College of Engineering, their freshman year seminar course includes the design and construction of a service project which serves a community need and also takes advantage of their particular skill set. In past years, in response to the service learning project goal of identifying a project with a specific, compelling community need that also includes engineering design elements, students have designed and built rooftop rainwater collection systems, vertical planters for efficient space utilization, and composters for several community gardens. Other service learning projects have included design and construction of location specific Little Free Libraries to combat illiteracy. Most recently, for AY 2017-18 the faculty team broadened the idea of community to include the global community in response to a joint UN/IEEE Humanitarian Technology Challenge (HTC)

Sustainable Development Goal (SDG) for food security. The goal of the FYS service learning project was to produce a working model of a solar-powered food dehydrator which, theoretically, could be used to combat hunger in communities far removed from Erie. In principle, a dehydrator can extend the shelf life of certain foods by preserving them for consumption at a later time, thereby addressing one aspect of the availability and accessibility of food. The feasibility of the idea was demonstrated in the current designs, while future iterations will stress the global aspect by restricting the designs to include only parts and components easily accessible in the local environment.

Finally, using an end-of-semester survey we found that not only were engineering students enthusiastic about working as a member of a multidisciplinary team (69% of respondents agreed that participating on a multidisciplinary team was beneficial to their educational experience), but they also indicated a willingness to contribute their time and (future) money in support of social issues like global hunger. It was, indeed, gratifying to document the positive responses on issues of social awareness for this post-millennial [1] group of engineering students.

SERVICE LEARNING AS PART OF FYS

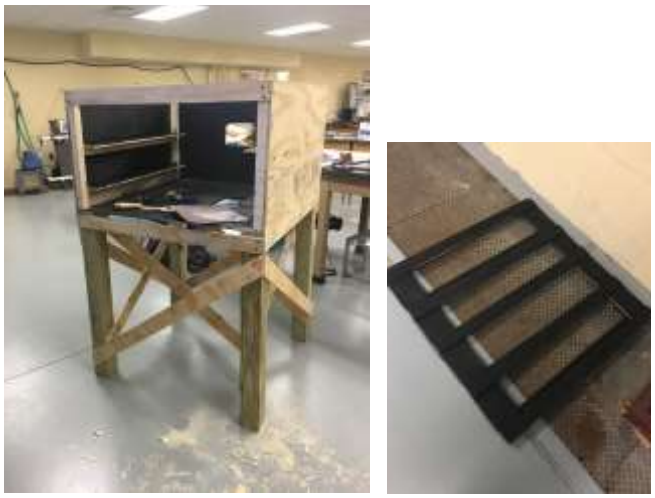
Early on in the fall semester, the freshman engineering cohort is assembled together in order to introduce and discuss the need and opportunity for engagement in the community. This is not simply a hypothetical exercise. In Erie, the need is particularly acute. For example, in 2016 the estimated poverty rate [2] in the city of Erie was 27.3%, compared to the national rate of 14.0%. As a result, approximately 75% of children in the Erie City School District qualify for the National School Lunch program [3]. At GU, the Office of Service Learning (OSL) plays a direct role. In addition to describing the need, OSL also funds the projects. It should also be noted that current and previous teams have successfully engaged corporate or private sponsors to donate both materials and expertise in support of these projects. Thus in addition to developing some useful networking skills, this process also serves to advertise the service learning project to the community which, in turn, provides one small way for the company to engage in community service.

At Gannon, the freshman engineering cohort is typically divided across three sections. Within each section, students are assigned to multidisciplinary (i.e., mechanical, electrical, environmental, biomedical, and industrial engineering) teams comprising typically between 5-6 members. Once the teams are formed, they will spend the next 6 weeks developing their proposal. Along the way, multiple interim progress reports are submitted and evaluated. At the end of 6 weeks, the stakeholders are invited to class to score the competing designs. Each team makes a presentation and each team member has a presentation role. At the end of the competition design phase, the winning team from each section advances to the next phase: construction. At this point, materials are acquired and the team leader blends in students from the other non-winning teams. In this way, they learn valuable aspects of project management: scheduling tasks and assigning talent to those tasks. Course faculty are involved in order to ensure that timely progress is made and to provide guidance, as necessary. Finally, by the end of fall semester the project is completed and the design is delivered to the stakeholder.

SOLAR FOOD DEHYDRATOR

The solar food dehydrator was designed and developed using this model. However, this particular project was chosen in response to a broader, worldwide humanitarian challenge. In 2015, leaders of 193 nations came together and developed a plan to address, among others, global hunger. The group put forth 17 Sustainable Development Goals (SDG) that, if achieved, would significantly impact the living conditions of billions of people around the world. In addition to zero hunger, other goals included no poverty, affordable and clean energy, and good health and well-being. The United Nations Development Programme (UNDP) is a leader in this global challenge.

As envisioned, the solar food dehydrator (SFD) is designed to extend the shelf life of foods by using solar energy to remove moisture from the fruit or vegetable. That is, by moving warm air over and around the food, its moisture content can be substantially reduced. This helps to preserve food by slowing down bacterial growth. In its current design, the solar food dehydrator was constructed using materials and parts available from a local home goods store. The initial stage of construction of one of the food dehydrators is shown in Fig. 1.

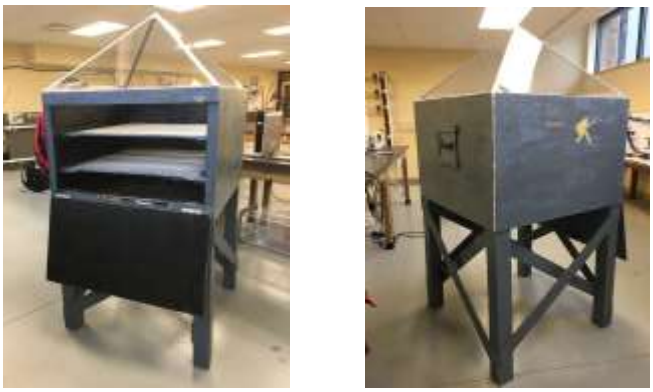


(a) (b)

Figure 1: Construction phase of the solar food dehydrator: (a) box-frame with ventilation doors and food tray rails, (b) food tray prior to installation of a mesh screen.

Figure 1a depicts the overall size and shape of the SFD, and shows the location of two removable ventilation doors

which can be opened for circulation. In Fig. 1b, a food tray is shown in initial construction stage. The completed SFD is shown in Fig. 2.



(a) (b)

Figure 2: Final phase of the solar food dehydrator: (a) hinged door is open showing the two removable trays, (b) completed design.

Figure 2a shows the SFD with its two food trays in position. The trays were designed to slide back and forth and can be completely removed for easy loading/unloading. Figure 2 also illustrates the use of a Plexiglas roof which allows sunlight to enter the enclosed space. As can be seen, the interior surface has been painted black to enhance heat absorption.

STUDENT TRENDS ON SOCIAL ISSUES

At the end of the semester, a survey on student attitudes towards social awareness and activism was distributed. Additionally, several questions on faith and the role of organized religion were asked. These seemed particularly relevant for Gannon students. Response were limited to: Not Important, Neutral, Somewhat Important, Important, Very Important. Unless otherwise indicated, students responding Somewhat Important, Important, or Very Important were lumped together as an affirmative response. The data were initially separated into male and female responses; however since the latter sample size was only 10% of total respondents, data are presented without attribution of sex. Finally, 40 completed surveys were returned.

The first two survey questions addressed the issue of awareness of hunger as a global problem, and the relevance of the solar food dryer project in addressing global hunger. 90% of respondents agreed that global hunger was a somewhat-to-very important problem, while only 5% of respondents disagreed. A smaller, but still majority, 58% of respondents agreed that the solar food dehydrator service learning project was relevant in addressing this problem while 18% of respondents disagreed that the project was relevant.

Several questions were then asked to gauge the willingness of students to volunteer their time and/or future earnings towards social issues. When asked whether as a practicing engineer they were likely to volunteer for a weekend community service project, 73% responded affirmative, while only 10% indicated they were unlikely to volunteer for such activities. Next, we switched the "cost" from time to money and asked "Would you accept a lower paying position with an employer known for encouraging and giving time off to its employees to get involved in the community?" 53% responded affirmative that they would accept such a position with a salary 10% less than the average, while 18% responded that they were unlikely to accept such an offer. When the same question was paired with a 20% lower average salary, only 30% responded affirmative, while 40% indicated they were unlikely to accept such a position. This data is reasonably comparable to a recent USA Today/Ipsos poll [4] surveying post-millennials on their views of their future. In that poll, by deduction approximately half of the respondents (1,112 young people aged 13-24) indicated that their generation would be equal to or better off than their parent's generation (in the USA Today/Ipsos survey, half of the respondents indicated that their generation would be worse off than their parent's generation). The inference is that those believing that their future will be equal to or better than their parent's generation would be more likely to respond affirmatively to such salary-related questions. This, of course, does not preclude those with less positive views of their future from responding affirmatively to such salary-related questions. Interestingly, the same poll found that the older of those post-millennials surveyed (including the 18 year olds) were even more pessimistic. By a more than 3:1 ratio, they believed that their generation would be worse off. Our data here are even more striking since the same USA Today/Ipsos poll found that while the overwhelming majority of those now in middle school or high school plan to attend college, approximately two-thirds say they aren't sure they'll be able to afford it. As a side-note, the poll did not indicate the planned fields of study.

Hence, Gannon students, as a whole, may be more inclined to undertake such activities. It is well understood that the fundamental mission of the university is to prepare students to become global citizens through programs grounded in the liberal arts and sciences and professional specializations via a comprehensive, values-centered learning experience that emphasizes faith, leadership, inclusiveness, and social responsibility. Among the themes of modern catholic social teachings are the recognition of life and dignity of the human person, call to family, community, and participation, and care for God's creation. 44% of respondents indicated that organized religion was important in their daily lives, while only 23% disagreed. A follow-on survey at a corresponding un-affiliated institution would be of interest.

CONCLUSIONS

The Gannon community, including students, faculty, staff, and administration plays an integral role in the health and well-being of its university neighbors. With the support of

administration, many community service initiatives have been and continue to be undertaken which directly supports the fundamental mission of the university to prepare students to be global citizens through programs grounded in the liberal arts and sciences and professional specializations via a comprehensive, values-centered learning experience that emphasizes faith, leadership, inclusiveness, and social responsibility. The current post-millennial engineering cohort adheres to and perhaps even expands on this ideal by overwhelmingly providing their support of such initiatives and activities. Further, a majority responded that they would be willing to make financial sacrifices to work at a company with similar community service intent.

ACKNOWLEDGMENT

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