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Service Learning Projects to Improve Senior Citizen Mobility

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Article Info

Abstract
The main objective of this project in our graphics course was to find ways of improving senior citizen mobility. Service learning is a form of experiential learning. Students use their classroom learning and apply the course concepts to address the needs identified by the service learning project. Service learning experiences are organized for students to learn and apply skills and knowledge related to course learning objectives. Reflection allows a means for the evaluation of students based on measurable outcomes.

1. Introduction
Service learning is a teaching method that combines academic coursework with practical applications to address challenges through service projects. It focuses on critical thinking to develop students' academic skills, sense of civic responsibility, and commitment to the community. Service learning promotes active learning and fosters a sense of civic responsibility [1]. Service learning strengthens critical thinking, interpersonal and communication skills, and promotes student personal and social growth and leadership development. Advocates of service learning see the benefits as being similar to those of community service but with added focus and structure, elements that help make the experience more meaningful for all involved [2].

2. Research Methods
Service learning projects need to incorporate at least one service project or experience that is tied to course learning. The service learning project has to be required for all students, not just for extra credit. The service learning project must have defined project requirements or defined number of hours in the 25 to 45-hour range.
The service learning project must be a good fit with the learning objectives of a specific course. It must provide a needed service for the community or benefit some non-profit organization. The time commitment and skills needed should be aligned with the course goals and student learning objectives. We implemented service learning in the course MENG 1132 Engineering Graphics.

Our course activities to match the course objectives are
1. Students design a tricycle for seniors.
2. Students write a paper and do a presentation on the design by the end of the semester.
3. Students will take part in weekly activities on their project.

Studies have supported activity theory by demonstrating that a retired senior's participation in an activity contributes to his or her subjective well-being [3]. Older people need support not only in stationary situations, but also in mobile situations outside their homes [4].
Project based learning is a good way to introduce innovation in a graphics course. Innovation is the exploitation of change as an opportunity for a business or service. Innovation can be taught and learned [5]. On the average about sixty percent of all jobs in the U.S. are generated by firms with twenty or fewer employees.

Large firms with over five hundred employees generate less than fifteen percent of all new jobs [6]. Students have to learn to design in a way that is ethical, socially conscious, environmentally sound, and globally aware [7]. Education must make active learning the predominant technical student learning mode [8]. This paper explores the idea of building a tricycle for older people as a tool for teaching innovation in an inexpensive and impactful approach.

3. The Concept
Students can develop entrepreneurial skills by working to generate, evaluate, develop, and market their innovation. Faculty members should be encouraged to participate as student team mentors. At the beginning of the semester students in the class generate ideas for potential products. The product has to be designed and presented to the class by the end of the semester, so it has to be a project that is doable by the end of the semester. The project has to be at the skill level of the students. Students can imagine great projects, but they have to be able to design a prototype. Criteria can be added, depending on the limitations of the school.

Once the student has decided on a project concept and objectives, they will work on developing their product. This will involve product specific development using engineering and business concepts. Product protection and marketing will depend on the schools existing policies and procedures.

4. Product Development
The process of taking an idea from initial conception to market is called product development. It includes idea generation, market research, product evaluation and selection, design and development, product protection and commercialization [9].

1. Idea Generation
Idea generation refers to generation or identification of potentially marketable product ideas. Highly motivated enterprising students are an ideal source of potentially marketable, creative product concepts. The opportunity to learn real business and engineering skills while working on one's own idea should appeal to many students.

The process most often used for idea generation is brainstorming [10]. This involves students who suggest anything that comes to their mind, and feed off one another's ideas, and seeks to create a large list of potential products in an environment free of criticism. Students will then work to generate potentially marketable product concepts.

Once the list of potential products is developed, each product or concept should be evaluated, considering student interest in the project, strengths and weaknesses of the concept, feasibility of execution, etc. By the end of this process each student should have a potentially workable project. Once this process has been completed, the student can begin their design of prototype, and preparing to present and defend their ideas before their peers.

2. Market Research
During this phase students will perform searches to make sure they are not duplicating products already on the market. They should also consider demographic factors, identify competing products, establish timelines, and get a better estimate of the resources needed to complete their project.

The researchers can utilize an interest survey as a source of data collection. The survey questions are analyzed to determine the need or desire for a new product. The survey needs to provide an area for suggestions and comments. The survey questions are designed to determine specific information. The researchers are interested in determining the age, sex, race and geographical location of persons being surveyed. Also, the researchers need to determine the amount a consumer is willing to spend on this type of device. Analysis of the interest survey will indicate whether the consumers polled are interested in their product. A positive survey result can lead the student to contemplate commercialization of the product.

3. Product Evaluation and Selection
Once potentially feasible ideas have been generated and market analysis has been performed students must present their concepts to their peers. Their peers will evaluate their concepts according to some established criteria. The evaluation criteria should include consideration of the product such as manufacturability, manufacturing costs, raw material availability, size, shape, material, color, price, projected sales volume, profitability, market strategy, adaptability to customer needs, and estimated cost of marketing. External factors to consider are market size, potential customers, competition, and demand. Internal factors include resources available, financing, equipment, time, and fit. This step is a filtering process in which only the ideas with greatest potential will succeed. Students will learn to evaluate potential products.

5. Results
The details related to the design and development of a particular product depends on the nature of the product. Students should develop a timeline to guide the development of the product.
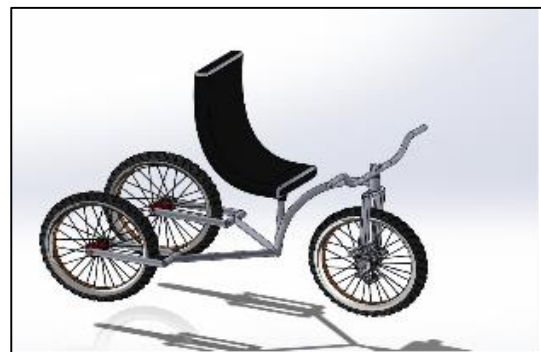
Fig 1: Tricycle by Gabriel

The first tricycle is similar to a kid tricycle (Fig. 1). In this project emphasis is placed on repairability and reduction of cost, while giving the consumer the ability to purchase upgrades or features.

The second tricycle has the unique features is that it is powered by both foot pedals and hand-operated cranks. This allows for users who have leg disabilities to operate the tricycle. It also allows people to distribute the workload up between their legs and their arms. (Fig. 2). This tricycle features a comfortable seat and two armrests that support the arms of the user. The arm rests also double as safety bars that keep the rider in a stable position when the vehicle is in motion. On the back of the rider's seat are two hooks that can be used to attach a box for carrying the belongings of the rider. The box can also be easily removed if it is not desired.

Fig 2: Tricycle by Jeffrey

The third project sits much lower to the ground making it easier to mount than typical tricycle seats (Fig. 3). On the frame of the tricycle is attached a full form seat with padded stool and backrest. Behind the seat of the trike there is a basket attached for use in grocery shopping or other transportation uses. Above the seat of the trike there is a detachable canopy that covers from the front pedals to the basket on the back in order to keep the rider and their cargo dry/safe in the event of bad weather or shaded from the full sun. In front of the seat where the rider can reach, there will be both a phone holder and a water bottle holder attached.

The aim of the next project was to provide a medium of transportation (movement) for the elderly while providing them with a method of recreation and improving their health as well. (Fig. 4).
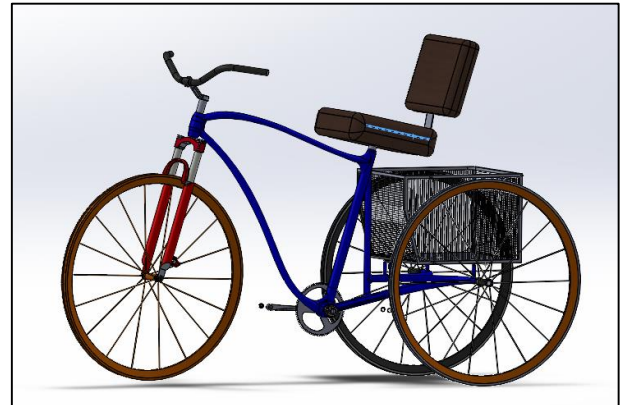

Fig 3: Tricycle by Thad
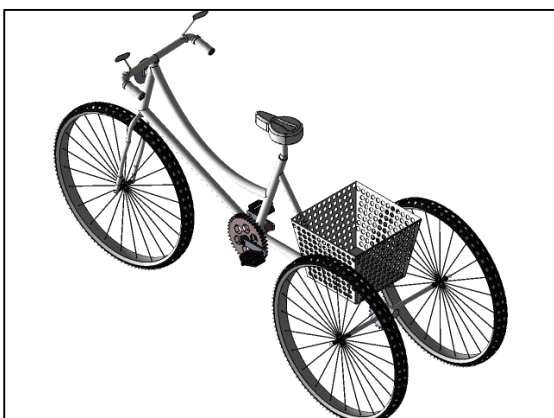
Fig 4: Tricycle by Mmesoma

The frame of the next tricycle is made of carbon fiber so that the bike isn't too heavy for lifting this will also help with aerodynamic. The basket is designed so that air flow can pass through easily and not cause any resistance to the wind. The handle bars are a wide with comfortable grips (Fig.5).

Fig 5: Tricycle by Vincent

6. Discussion
Protection of products and intellectual properties by patenting or copywriting of new products are essential for long term survival and growth. Securing a patent can take up to two years and cost up to $10,000 in legal fees. Intellectual property policy protects the rights of all co-inventors. All participants must keep careful records of their activities in the form of engineering log books.

Once products have been conceived, selected, developed and protected, they must be successfully commercialized. Commercialization requires consumers who are willing to buy the products at the price and quality that make these products economically profitable.

As each of the above steps is accomplished, every student should submit a brief informative report summarizing their activities. A formal presentation must be done at the end of the semester to develop their oral communication skills. The students are graded on their paper and presentation of the project.

7. Conclusion
Through our example, we have shown how a project can be taken from an idea to design of the product. We hope the background information and examples will be useful to other schools in development of innovative service learning products in a graphics course.

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