2004-486

Engineering Faculty Sabbatical – It could be the time of your life!

Richard M. Goff, Ph.D., Associate Professor
College of Engineering, Virginia Tech

An emerging trend - follow your dream to bring joy and passion to your students.

Abstract

In the fall of 2002, after serving seven years on the faculty of the Division of Engineering Fundamentals at Virginia Tech teaching primarily first year engineering students and sitting on numerous committees, I decided to make a move to be more involved in industry to see what "real engineers" actually do these days. I didn't choose just any industry, but one that I am passionate about – the motorcycle industry. More specifically, I chose Harley-Davidson Motor Company, Inc. The first Harley-Davidson® motorcycle was built in 1903 in Milwaukee, Wisconsin. The fall of 2003 was to be the 100th anniversary of this event and would be marked by rides from the four borders of the U.S. to Milwaukee all converging on August 27th, 2003. The fall semester work starts at Virginia Tech on August 10th and I knew that I wanted to be riding my Harley-Davidson® motorcycle across from the Southwest to Milwaukee when classes started. I also knew that I wanted to work with this legendary company so I needed a plan.

What I proposed was to consult with Harley-Davidson Motor Company, Inc. and teach an Introduction to Mechanical Engineering class at the Milwaukee School of Engineering (MSOE) while on Sabbatical in Milwaukee during fall semester 2003. As part of this proposal, I would acquire engine parts and engineering drawings from Harley-Davidson® to use as hands-on activities in the design graphics part of the introduction to ME class at MSOE and then bring these tested materials and activities back to Virginia Tech.

This paper describes my experience interviewing with Harley-Davidson® and MSOE, my "Ride Home" to Milwaukee as well as my experiences working as a practicing engineer at Harley-Davidson®. I describe the Motor Company as well as working with Harley-Davidson University. I also describe my experience teaching a small class of 18 first year students at MSOE and the hands-on learning activities used in class. I had the time of my life! The words "rekindled passion" don't even begin to describe my renewed love of teaching.

My Teaching Philosophy

The prime goal of my teaching is to empower my students to discover their own innate abilities and skills and how to apply them. Through my research into educational psychology and my own experience, I have found that students learn when they discover and re-invent knowledge for themselves. I strive to create opportunities and scenarios for them to be able to experience their own creativity and unique talents. Hands-on collaborative discovery environments are my specialty. Engineering used to include labs, shop work and industrial experience. After Sputnik, engineering education took a decided swing toward a theoretical approach to instruction. Since I began teaching in 1976, I have attempted to swing the pendulum back to more experientially based education.

I view teaching as a joint adventure rather than a transmittal of information. An analogy of an expedition guide comes to mind. Like a guide, I chart the course, prepare my students to meet the challenges and guide them through. They garner knowledge along the way and discover who they are and what their special contributions can be. Together we experience the joy of their success in the venture.

I strive to keep the classroom exciting and interesting. Relationship is the key. We are constantly learning from one another. Being attentive to the pulse of the class, I watch students and listen to them. For me, teaching and learning is an enjoyable experience so I create a nurturing and stimulating environment. While with the students, I am thinking, "What is important? What is engaging? What is the best way to learn at this moment?"

My students will become engineers, teachers and citizens. My intention is that, through my teaching, they will be in touch with their natural enthusiasm for learning, will have built self-confidence, will have learned the tools necessary to continue their studies, and ultimately, will contribute to the creation of a better world.

Introduction

This paper is intended to communicate an experience. An experience that when communicated generates excitement in the listener and a smile on their face. An experience that when communicated can rekindle a fire in the listener. My intention is that this is a fire that the reader can personalize and glimpse the vision that they too could generate a similar experience for themselves. While reading this paper, envision an activity that you, the reader, would like to pursue to enrich your teaching experience. Imagine what you might do to expand your students' educational experience.

What happens to a teacher of engineering that has been in a university for many years, rarely venturing out into the world of industry to see what is happening there that relates to himself and his students? Could he still do real engineering for industry? Did I have self-confidence enough to produce results as a practicing engineer? Would a hands-on experience give me the tools to discover the knowledge for myself? Am I teaching my students the skills necessary to succeed in industry? I assumed that I was. I think most of us in academia assume that we are. We have advisory councils, do curriculum redesign, have study groups, participate in workshops on

teaching and learning and attend conferences such as ASEE where we interact with our peers. But I contend that we, as academics, are isolated from the day-to-day activities in industry. Even our research work is generally done in our own labs away from the industries we are doing the work for. Given that very few graduate engineers with bachelor degrees pursue research, also given the fact that I teach mostly first year students, it seemed appropriate that I should investigate work in industry rather than doing research at a laboratory. I felt that this experience would be more directly transferable and of more immediate interest to my students.

The Plan

In the fall of 2002, after serving seven years on the faculty of the Division of Engineering Fundamentals at Virginia Tech teaching primarily first year engineering students and sitting on numerous committees, I decided to make a move to be more involved in industry to see what "real engineers" actually do these days. I didn't choose just any industry, but one that I am passionate about – the motorcycle industry. More specifically, I chose Harley-Davidson® Motor Company, Inc. The first Harley-Davidson® motorcycle was built in 1903 in Milwaukee, Wisconsin. The fall of 2003 was to be the 100th anniversary of this event and would be marked by rides from the four corners of the U.S. to Milwaukee all converging on August 27th, 2003. The fall semester work starts at Virginia Tech on August 10th and I knew that I wanted to be riding my Harley-Davidson® motorcycle across from the Southwest to Milwaukee when classes started. I also knew that I wanted to work with this legendary company so I needed a plan.

I was eligible to apply for a research leave so I used this opportunity to create a plan to use Harley-Davidson® as the focus of my work. I also wanted to share my experience immediately in the classroom and so also planned to teach a class while in Milwaukee.

What I proposed was to consult with Harley-Davidson Motor Company, Inc. and teach an Introduction to Mechanical Engineering class at the Milwaukee School of Engineering (MSOE) while on Sabbatical in Milwaukee during fall semester 2003. As part of this proposal, I would acquire engine parts and engineering drawings from Harley-Davidson® to use as hands-on activities in the design graphics part of the introduction to ME class at MSOE and then bring these tested materials and activities back to Virginia Tech.

Overview

As is often repeated, "the best laid plans…", I was able to make most of this happen. Although, not all or at least not exactly the way that I had envisioned it. I did get to work for Harley-Davidson® Motor Company. I did get to teach at MSOE. I did get to take a class at Harley-Davidson® University. I didn't get any Harley® hardware to bring back to my lab as I had planned. I did meet wonderful people and make contacts and friends at both places that will last a lifetime and will be a resource for future collaboration. An unplanned collaboration was formed with one of the professors at MSOE and the Director of the Rapid Prototyping Facility at MSOE. Through them, I acquired many engineering prints that will be used in my classes and labs at Virginia Tech. I declare my research leave a complete success.

The Journey Begins

I submitted my proposal in October 2002 to my department head and to the dean and provost for consideration and approval. Once approved, it had to be approved by the board of visitors in January 2003. Once approved, I started to investigate how to make it happen. I had a contact at MSOE, but the only contacts I had at Harley-Davidson® were engineers that I had met on the production line during plant tours on previous visits to Milwaukee.

The big breakthrough came when I attended the March Bike Week Rally in Daytona Beach, Florida. I went to the Harley-Davidson® exhibit at the Ocean Center and while talking with one of the Harley engineers at the Security Systems booth, we discussed my plan to take a research leave and my desire to consult for Harley-Davidson® during my leave. We talked for quite a while and then he gave me the name of a person to contact at Harley-Davidson® that might be able to help me. I was so excited. I was on my way. After returning home from Daytona, I called and was referred to the head of engineering. I called him and he had me speak with a couple engineering team leaders. One thing led to another and I had an interview set up in Milwaukee for early June.

While in Milwaukee in June for the Harley-Davidson® interview, I also met with the Head of Mechanical Engineering at MSOE. The results of these two interviews were that I had a class to teach at MSOE, but H-D was still a question. Later, I heard from the engineer I had met with in June that he didn't think four months was long enough for me to accomplish much in product development. I was back to attempting to find a fit for myself at H-D®. After relaying this information to my initial contact at Harley®, he told me that he might have a project for me that would fit very well and gave me the names of a couple of managers to contact when I got to Milwaukee.

The Successful Interview

I left Blacksburg, Virginia on July 27th, 2003 to ride my 1999 Harley-Davidson Electra Glide Classic® on a 4,000-mile journey. Initially, I rode to Milwaukee to meet with the folks at Harley-Davidson®, then out to Sturgis, South Dakota for the biggest bike rally in the U.S., then to Boulder, Colorado to see the hands-on learning facilities at the University of Colorado. Then down to Taos, New Mexico to house sit for a couple of weeks. Finally I started the Southwest Ride Home to Milwaukee for the Harley-Davidson® 100th anniversary celebration.

Toward the beginning of my ride, I met with three Harley-Davidson® managers in the Harley-Davidson® Rally Point Café for about an hour and a half. One of the attendees at the meeting was the man I had initially met in Daytona Beach. They proposed a project in the area of Quality Assurance and Customer Support that intrigued me and could clearly benefit both Harley-Davidson® Motor Company and myself. I was immediately struck by how forthcoming and genuine they were. Their enthusiasm for and commitment to the company was clear. They also were impressed by the fact that I was a rider, putting on more than 15,000 miles a year riding my Harley-Davidson®. I was an engineer, a customer, an enthusiast, a biker. I also had managed a motorcycle shop in the early 70's. It was a good match.

I left the meeting with a project challenge to think about during my riding for the next month. Later that day, I met with the folks at MSOE and firmed up my assignment for the fall quarter that would start right after Labor Day. I would teach one section of ME160 – Introduction to Mechanical Engineering and deliver two large lecture presentations in mid quarter on my experiences as an engineer for the Navy and in the Peace Corps as well as an update of my experiences at Harley-Davidson®.

The Ride Home and Celebrations

On August 21, I headed to Albuquerque start the "Ride Home". We vaguely followed old Route 66 through Albuquerque, NM; Amarillo, TX; Oklahoma City, OK; Kansas City, MO; Springfield, IL; to Milwaukee, WI. In Milwaukee, all the four rides from across the U.S. converged. The bridges and overpasses were thick with people shouting and waving "welcome home".

The week that followed was filled with bands and parties. Celebrations each night at the Summer Fest grounds, at dealerships, fairgrounds, and in the streets. A 10,000 Harley-Davidson® motorcycle parade on Saturday. As it was also the 100th anniversary of the Wright Brothers flight, I took the opportunity to ride up to Oshkosh, Wisconsin to the visit Experimental Aircraft Association (EAA) Museum to see a Wright Replica and other aircraft. The fact that I am an aerospace engineer today is a result of my dad and I building and flying model WWII fighters in the 1950's. I feel a strong connection with Oshkosh and the EAA. The culmination of the Harley 100th celebration week was a huge party with about 500,000 people down by the Lake Michigan. Top musical talent such as Tim McGraw and Elton John were playing and the Harley executives speaking. There was hardly an inch of clear ground to park a motorcycle on August 31st. It truly was the party of the century. On September 1st, Milwaukee was like a ghost town. All the bikes had departed. The party was over (for now).

Work Begins

By midweek, I was riding to Harley-Davidson® Motor Company located at 3700 West Juneau Avenue. I met with my supervisors and began my work there. My office space was in a large remodeled former motorcycle manufacturing building. In the building were normal office cubicles, but the uniqueness of this office was that large photographs of people on Harley-Davidsons® hung across the long wall above the desks. Also, motorcycles were parked beside the desks of service support personnel. The motorcycles are there to better serve the customers when they call for support.

The people at Harley-Davidson® are some of the most enjoyable people that I have ever worked with. They are always happy, enthusiastic, and committed to doing the best job that they are capable of. From managers to security personnel, each person was happy to be working there. Always thinking of the customer and the quality product that they produce. It is a wonderful company with a great product.

Photo 1. Harley-Davidson Motor Company, Inc. 3700 West Juneau Avenue, Milwaukee

My work at Harley-Davidson® involved conducting interviews with engineering and service support personnel regarding vehicle diagnostics tools as well as doing research in this area. I found everyone very forthcoming and focused on the best solutions for all stakeholders. I enjoyed coming to work everyday and became very grounded in the daily on the job activities at Harley-Davidson®. It became clear to me that even with a strong foundation of engineering skills that attitude, enthusiasm, spirit and communication skills were critically important in industry. This was definitely a message to bring back home to my students. The office and work environment and interpersonal skills were directly communicated to my students at MSOE. They, as new engineering students, need to get that their attitude toward their studies and work is critical to their success. They also need to know that they will not survive on engineering tools and skills alone. A broad based education is critical to a well-rounded individual and a complete engineer.

While I was at Harley-Davidson University®, I had the opportunity to attend a digital electronics course. This four day hands-on course allowed me to participate in and at the same time observe the training that is delivered to motorcycle technicians that work at Harley-Davidson® dealerships. I was not only able to learn, first hand, how to use the diagnostics tool, I also was able to interact with the technicians and listen to their experiences in the field. Technicians feel strongly that engineers should have maintenance experience with the equipment that they design.

A point that I immediately related to my MSOE students was to consider repair when designing devices or systems.

The instructor of the digital electronics course was top notch. He had a wonderful attitude, excellent presentation and was very knowledgeable. He had started life, as a technician himself so he knew the work first hand. I again got how important self-discovery of knowledge is. The instructor can talk about it, but until you get your hands on it and create it anew, you haven't learned it. By the time I completed this course, along with my previous experience, I was competent to diagnose state of the art motorcycle electrical problems.

Teaching at MSOE

My approach to teaching has always been focused on creating an environment where my students can discover and experience knowledge for themselves. I strive to create situations so that they can experience confidence in themselves and learn to take risks for ideas that they feel are valid and important. The focus in my classes is on the creation and communication of their ideas based on the material we are covering. A student's attitude and her approach to learning and work are equally if not more important than the content of the material in a particular class.

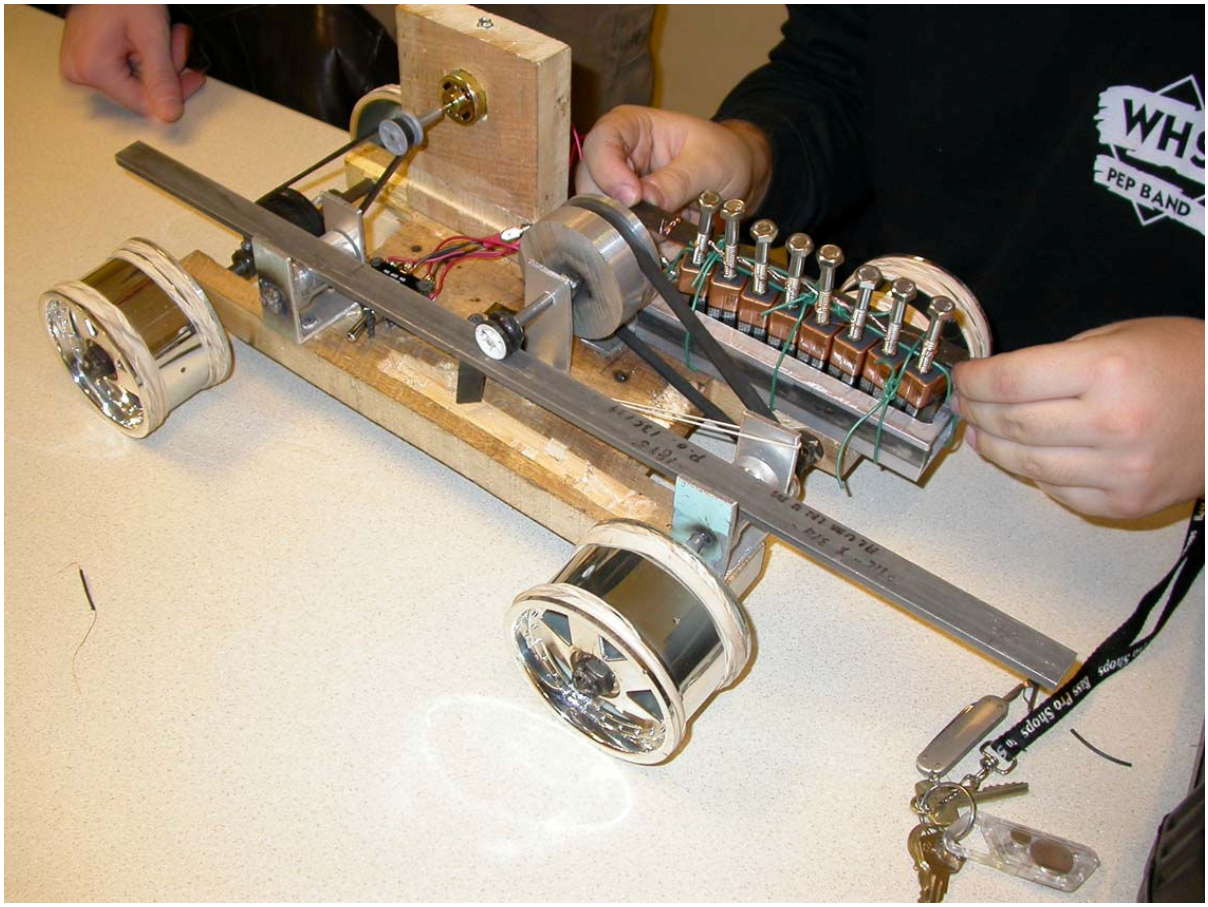

Photo 2. ME 160 Design Project a Vehicle that travels 15 feet and then backs up 5 feet.

In my ME 160, Introduction to Mechanical Engineering class at the Milwaukee School of Engineering, I used my work at Harley-Davidson® as a springboard to generate excitement in class. Being mechanical engineers, they were very interested in my work with Harley. Several collaborative hands-on activities were used throughout the quarter to engage students in the material. We used objects for sketching rather than figures from books, we measured them and then created dimensioned drawings of them. One simple example was a AAA battery that was physically measured and used for a dimensioned three view sketch. We used parts and objects for SolidWorks CAD models and drawings rather than book figures. The class consisted of a one-hour small class lecture, a one-hour large group lecture and a two-hour lab each week. The one-hour small class lecture was devoted to general introduction to engineering topics. The large group lecture was given to the entire first year Mechanical Engineering class of about 150 students. Representatives from various industries and selected faculty spoke about their industries and experiences while practicing engineering. I delivered one of these large group lectures about my experiences as an engineer for the Navy and as an engineer in the Peace Corps in Micronesia.

Using Laptops in the classroom for the two-hour lab period, allowed me to coach students through any difficulties with SolidWorks. They progressed much more quickly than if they had listened to me talk and then gone back to their dorm rooms to work on CAD projects. The team design project for the quarter was to design, build, document, and demonstrate a vehicle that could travel 15 feet and back up 5 feet. The total cost could not be more than $30. There were no other constraints on the project. The documentation consisted of a full engineering report covering the design process including hand sketches of alternative solutions as well as SolidWorks models, detailed and assembly drawings. There were 18 students in this class and I used teams of three students for the projects as well as some preliminary exercises to generate and foster the teams before the big project was begun.

The students were very responsive and interactive in class, partially a function of the small class size, but also a function of the open, active and inquiry based environment that was created. They can read the facts in the book. What they don't get from the book is the joy and excitement of what it is to be an engineer that I bring to class. Also to be able to interact with fellow students in an atmosphere that promotes participation and learning. It is on this exciting, positive, and supportive atmosphere that I focus my attention.

Results

The process of going to my office at Harley-Davidson®, living my dream of working for this great company, experiencing the excitement of the work then going across town to teach my ME class with new enthusiasm and passion, my students feeding from my excitement, generating their own joy and allowing me to feed from that was very satisfying.

I returned to Virginia Tech with renewed perspective. The value generated for Virginia Tech are my many contacts that will be useful to the university in future collaborations with both Harley-Davidson Motor Company® as well as The Milwaukee School of Engineering. One immediate outcome of my collaboration at MSOE is the book on Engineering Print reading that I am in the process of writing using the prints acquired thru the Rapid Prototype Facility at MSOE.

The Future

I'm back in Blacksburg at Virginia Tech. I rode a total of 6,916 miles on my journey. I called it Riding the Long Way Home. It was more than a journey of miles. It was truly a journey of self. I have reinvented myself. My energy is renewed. My passion reignited. I am now in the middle of a new semester and I am teaching four classes of Engineering Design Graphics. I have been to the mountain. I had a dream two years ago and I have done what was necessary to realize my vision and to live my dream. I know that this process can be replicated by anyone with a dream and commitment to the realization of their vision. I have always held high standards for my students. Now, I feel that I am not willing to settle for anything less than their full participation and immersion in the joy of the educational process. This was truly an experience of a lifetime.

My suggestions for those of you that want to create a similar experience for yourself are to reflect on what have you always wanted to do then start envisioning it happening. Find something that you are passionate about and lay the plans to make it a reality. Create the contacts. Plan the steps. Make it happen. All it takes is your focused vision and then the action to manifest your dream. Whatever you want to do with your future. Begin it now!

Photo 3. The author on the Southwest Ride Home back to Milwaukee

RICHARD GOFF teaches introductory engineering subjects and is actively involved in bringing joy and wonder to the educational process. Recipient of numerous university teaching awards, he is committed to living life to its fullest including hands-on collaborative interdisciplinary design and active, learner centered classroom environments. When he is not teaching and learning, he is snowboarding or riding his Harley-Davidson®.