

## Civil Engineering

Ask an engineering student what the most exciting annual events that occur in the Department of Civil Engineering are and the Steel Bridge Competition and the Concrete Canoe Competition are likely to be named. What are these contests exactly? According to Professor Nick Hudyma -- a 2006 recipient of the Outstanding Undergraduate Teaching Award at the University of North Florida (UNF) -- they are engineering competitions in which students work together for a common goal of solving a technical problem within a specific time frame, with a certain amount of money, using specific materials, while following certain rules to achieve a functional and aesthetic standard. It is with these restraints that students have the opportunity to design and build in one competition, a twenty-one foot long steel bridge, and in the other a twenty-two foot concrete canoe.

The American Society of Civil Engineers (ASCE) is a professional organization which sponsors these competitions. Dr. Hudyma, faculty advisor for the UNF student chapter, explains that there are regional competitions where a number of college and university engineering teams compete with each other. The Southeastern (SE) Region, to which the UNF Engineering Program belongs, is one of the largest: there are thirty civil engineering programs represented in this region. In the Steel Bridge Competition, the top two schools from each region go on to the National Competition while in the case of the Concrete Canoe Competition only the top regional competitor can go to the National Competition. Professor Hudyma indicates that any college or university in each region that has a civil engineering program may participate. In the National Competitions, he

states that “big engineering schools” such as the University of California at Berkeley and the University of Texas at Austin often send teams representing their respective regions. The fact that UNF is a relatively small as well as young institution of higher learning means nothing in this regard as all the participants are devotees of engineering who take the same courses and study the same materials. Professor Hudyma further indicates that there were 45 teams that competed in the 2006 National Steel Bridge Competition. These 45 teams were the best from approximately 250 civil engineering programs which participate in the various regional Steel Bridge Competitions.

Professor Hudyma is extremely pleased with the students who participated in the Steel Bridge Competition last year: UNF came in second in the Southeast Regional Competition and were invited to participate in the National Competition in Salt Lake City. Here the UNF engineering students came in seventeenth for their design and construction of the Steel Bridge. Professor Hudyma asserts that this is “pretty fantastic” since this is only the second year of participation of the UNF students. He elaborates on the constraints placed on the students in these competitions: they have approximately 150 pages of rules that they must know, understand, and apply in the timed design, fabrication, construction, and display of the bridge. He indicates that the bridge is load tested; that is, the bridge is loaded with weights and the bridge deformation is measured in both the vertical and horizontal directions. Each aspect of the competition is scored by four judges who evaluate each bridge. Such aspects of the bridge as dimensions, connection, and size of members are taken into consideration. The judges must observe as to whether or not the students have used the proper sized bolt and dimensional

tolerances according to the strict guidelines of the rule book.

These bridges need to be functional as well as aesthetically pleasing. Professor Hudyma reflects that these problem solving competitions are very challenging and involve a lot of creativity. These competitions reflect real world situations in which the students are given a problem which has “an infinite number of solutions” but the students must solve the problem given the “real-world” constraints of time and money.

In regard to the Concrete Canoe competition, the rule book is shorter -- only about eighty pages -- and less strict. In this competition, the students need to design and build a canoe that floats and that is made out of concrete. Indeed the UNF engineering students did just this last year. Professor Hudyma states that in fact, it is “amazing what our students have done.” Their canoe floats without the addition of some other kind of material such as Styrofoam which students from the other college engineering programs used to keep their canoes afloat. The density of the concrete material used by UNF students is lighter than water, and they figured out how to accomplish this by themselves. The problem solving independence of the students illustrated in regard to the task of the making of the floating concrete canoe is the norm.

As indicated earlier, Dr. Hudyma is an advisor. Therefore, students can ask him for guidance in certain areas, but the students are predominantly on their own. Because of the successful independence, hard work, and creativity demonstrated by UNF engineering students, this professor has great confidence that these students will get to participate in the National Concrete Canoe Competition this coming year. He states, “The students know they can and will do it. They are very committed.”

The engineering students also do fundraising for these competitions. These projects cost a lot of money. The Steel Bridge project, for example, costs approximately \$2500.00 to purchase steel and associated equipment and material. The Concrete Canoe project costs even more, approximately \$3500.00. It is fortunate that these competitions gain much support from local professionals, according to Dr. Hudyma. This is important, as there is also travel to the competition costs involved. The first year UNF competed, the Regional Competition was in Tuscaloosa, Alabama while last year it was held in Gainesville, Florida; this year it is to be held in Knoxville, Tennessee. It is less expensive and problematic to place the components of the Steel Bridge in boxes and ship it than it is to send the Concrete Canoe, which, of course, cannot be broken down and sent in separate packages! These twenty-two to twenty-four foot boats require more ingenuity and more money to take to a different location than that of the Steel Bridge. This logistical aspect of the competition, however, is all part of the learning process of problem solving which is the ultimate task of engineers.

All of this work and planning done by these UNF engineering students illustrates how committed they are. Dr. Hudyma reports that all of the students are extremely busy. Many have part time jobs but they are committed to all aspects of the competition right down to the fundraising and transportation logistics. In addition, these students help “promote the engineering program and UNF” by contributing to various outreach programs to local elementary, middle and high schools. He relates this information as further indication of just how dedicated these students are.

Professor Hudyma observes that the students in the civil engineering program

who participate in the Steel Bridge and Concrete Canoe Competitions are transformed from being the stereotypical quiet students who love mathematics and science into individuals who maintain their seriousness for mathematics and science -- expertise in these areas are prerequisite for being engineers -- but who become less introverted and more active in the engineering community; in fact, this engineering professor maintains they become leaders. He asserts that while they become “more technically sound” through this intensely challenging problem solving experience of one or of the other of the competitions, they also transform into future leaders of society. They grow in confidence and therefore move out and into the world as active participants to help make it a better place. Not only do they become more mature technically through participation in these club competitions, but they also mature as individuals.

According to Professor Hudyma, as well as to his students mentioned below, engineering firms seek to recruit students who have experience in these club competitions. For example, the civil engineering firm Reynolds, Smith and Hills (RS & H) of Jacksonville, which was the mentoring firm for the Steel Bridge Competition last year, hired both UNF engineering graduates Jennifer Flowers and Jonathan Scott from the Steel Bridge Team. Ms. Flowers -- former president of both of the engineering societies on campus, the American Society of American Engineers (ASAE) and the ASCE -- the latter of which sponsors the competitions as noted earlier -- claims that both of these organizations helped her to “get involved in the professional world.” Both Ms. Flowers and Mr. Scott maintain that participation in the clubs in general and in the competitions in particular helped them to be introduced to engineers around Jacksonville

as well as to be exposed to different aspects of engineering which helped them determine what they are most interested in. The club not only helped them make connections through the local engineers they met, but the Steel Bridge Competition also gave them experience in design and construction. This competition experience is a transformational learning opportunity which evolved into the playing of a significant role in society as well as reliable income for these individuals.

Professor Nick Hudyma indicates that the Engineering Program at UNF provides a wonderful transformational learning opportunity through the ASCE sponsored Steel Bridge and Concrete Canoe Competitions which greatly complement and go beyond just course work. He states that it is the opportunity to become fully engaged in such competitions that help create “well rounded engineers” instead of just “run of the mill” ones. This professor claims that this is what engineering firms are looking for when doing searches for new engineers to become additional assets to their firms. As indicated to some extent above, Jennifer Flowers and Jonathan Scott are evidence of this search and find as both are now employed in the Bridge Department of Reynolds, Smith, and Hills.

It is likely that the undergraduate Jesse Parkhurst will also be recruited in such a way when he graduates from his program in Mechanical Engineering at UNF for last year he was one of the captains on the Concrete Canoe Team. Mr. Parkhurst indicates in an interview that he did most of the hydrodynamic and structural design of the canoe in competition. This student, who asserts that these projects “help to challenge” him to apply what he learns in the classroom -- which echoes the goals for students of Dr.

Hudyma mentioned above -- has also undoubtedly been stretched by these competition based transformational learning opportunities provided in the Engineering Department at the UNF.

These three students -- Jennifer Flowers, Jonathan Scott, and Jesse Parkhurst -- all epitomize the feeling expressed by their mentor when he asserts, "I love what I do."

There is a reason that Professor Nick Hudyma received one of the UNF 2006 Outstanding Undergraduate Teaching Awards this year and that his students are so enthusiastic, so committed, such future leaders of America: they have him as a model. The guidance and example of Professor Nick Hudyma is undoubtedly the catalyst for a great part of the transformational learning which clearly occurs in this department.

#### Works Cited

Flowers, Jennifer. Personal interview. 21 Sept. 2006.

Hudyma, Nick. Personal interview. 18 Aug. 2006.

Parkhurst, Jesse. Personal interview. 21 Sept. 2006.

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