

# EVOLUTION OF THE CONCRETE CANOE TEAM



BY TOMMY NEWTON

**IN THE PAST ELEVEN YEARS, THE CONCRETE CANOE HAS DONE MORE THAN FLOAT; IT HAS HELPED WESTERN'S CIVIL ENGINEERING PROGRAM RISE ABOVE REGIONAL COMPETITORS AND CRUISE TO NATIONAL PROMINENCE.**

Western civil engineering students finished fourth in the 2002 National Concrete Canoe Competition, including a first-place finish in the event's academic portion. In the 2000 and 2001 national competitions, WKU finished tenth and eighth, respectively. The team advanced to the 2003 national event by winning its eighth straight Ohio Valley regional title this spring.

"Obviously a national championship would be nice, but that's not the goal," said Matthew Dettman, team adviser and the James D. Scott Professor of Civil Engineering. "I tell the students that when we've done everything we can

do to put the best product forward, we'll be successful regardless of how we finish."

Dettman's theory about the concrete canoe and other project-based learning experiences in WKU's Department of Engineering is simple. "This project is not about building a concrete canoe," he said. "It's about building engineers. The canoe project teaches problem solving, teamwork, and initiative."

Each year team captains learn that project management also requires people management, a key component for the team's success, Dettman said. "Managing, scheduling, and documenting the time and work can be difficult, but it provides one of the most important lessons — you can't just leave the details behind," he said.

Students who spend nine or ten months each year working on the concrete canoe agree.

"The main thing we learn out of this is problem solving," Scott Neighbors, co-captain of the 2001 canoe team, said after that year's competition. "At any point in time you can face a problem that must be solved before the project can continue."

"Building a concrete canoe is not something you'd do every day in the real world, but all the management techniques will be used daily," Neighbors said. "As the manager of a construction site, I'd have to manage people to get the job done."

During the 2001-02 year, students Clay Ellis of Beaver Dam and Deneatra Flener of Morgantown led the team that created the canoe named "Evolution," and were responsible for a ten month project that involved hours of planning, design, construction, concrete mixing, testing, project reports, display construction, and fund-raising.

"If you want to win, you've got to set your goal to be the best," Ellis said during the 2002 regional competition at Basil Griffin Park in Bowling Green.

Work on 2002's "Evolution" actually began on the trip back from the 2001 national competition in San Diego. When the 2001-02 academic year began in August, Dettman and students met to select team leaders and make plans for the canoe. "Evolution" was more than a name. It also described how far the concrete canoe team

had progressed in ten years and detailed the team's history in national competition.

"I always tell them that the only team they are competing against is the previous WKU team," Dettman said. "If they can take what was learned in the previous year and grow from there and continue to improve, then they will be successful. We cannot control what the other teams do. All we can do is learn from the past, improve, and turn in the best possible performance."

In August 2001, Ellis, Flener, and other team members began work on "Evolution" by dismantling the form used to build "Aquavette," the canoe that finished eighth in the nation.

"If you want to do well at nationals, you've got to start from scratch right here," said Ellis, who was part of the concrete canoe team for three years. He got his start by helping the rowers and moved up in responsibility each year, culminating in being co-captain.

While the students knew the canoe's basic look wouldn't change, they knew that design changes would improve speed and material changes would improve durability. Designs were drawn on a computer and smaller models — each with a slightly different design — were built and tested.

In October 2001, Ellis, Flener, and Matt Shockley of

Mount Washington covered the ten small models — which were made of foam, plywood, and fiberglass mesh — with a concrete mixture that included Portland cement, ceramic 714 and 1430 (small aggregates), microspheres, recyclospheres, glass bubbles, durafibers, structural fibers, acrylset, latex, and superplasticizer.

The key, Flener said, was keeping the concrete light-weight but strong.

For example, the glass bubbles provide strength without weight. ("Evolution" was 21 feet, 4 inches long and weighed 95 pounds.)

After the final design and concrete mixture were selected, the students built the form that gave "Evolution" its shape. The form was built of 97 wooden cross sections separated by 2-inch foam sections. Each cross section was a different size giving the form its shape from a wide middle to pointed ends.

The cross sections and foam were covered with drywall compound then sanded before the 36 hour process of pouring concrete in three, 1/8 inch layers. Once the concrete hardened, the form was removed and the canoe was sanded, painted, and prepared for competition.

In "Evolution" Ellis and his team were looking for a design that would provide additional speed in the straight-aways during the rowing competitions. "Aquavette" was fast in the turns but slow in the straight-aways. Ellis wanted "Evolution" to have both. "What we do is pick and choose and go off the rowers' feelings from last year," Ellis said.

The gut feelings and calculations proved correct as "Evolution" turned in the fastest times of any WKU concrete canoe. In the April 2002 regional, Ellis and Chris Bates paddled "Evolution" to a 1 minute, 13 second run on the lake at Basil Griffin Park.

"This is probably the best boat we've put in the water and I like to be able to make that comment each year," Dettman said after the 2002 regionals.

For the past eight years, WKU's concrete canoe team



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has won the Ohio Valley Regional and advanced to nationals. Both competitions include athletic portions (men's, women's, and co-ed races) and academic portions (display, design, paper and oral report).

At the 2002 national competition in Madison, Wisconsin, "Evolution" finished 3.5 points from second place among 25 schools that qualified from the more than 250 teams that entered regional competitions. The

fourth-place overall finish, the team's best ever, included a first-place finish in the academic portion.

"To finish first in the nation in the academic portion is really an achievement for us," Dettman said. "The competition was tough and we were able to step up in the academics. For us to win the academics portion against master's and doctoral students is really an outstanding achievement."

The concrete canoe is one example of the WKU Engineering Department's focus on project-based learning. The department's mission is to produce graduates who are competent engineering practitioners with a foundation of basic science, math, and engineering knowledge combined with practical knowledge and experience in applying existing technology to contemporary problems.

Through project-based learning experiences, Western students are developing the engineering, communication, and teamwork skills needed in industry. Students from freshmen to upperclassmen work on projects, both inside and outside the classroom, that develop the skills necessary to become successful civil, mechanical, or electrical engineers.

This year freshman civil engineering students designed and built a concrete toboggan. "I'm sure we'll retain more students in engineering because we do projects in the freshman year," Dettman said.

"As I told the mother of a prospective student, our students learn to do things through project-based learning," Dettman said. "In projects like the concrete toboggan and canoe, they learn to take a project from concept to completion."



Cross-sections of "Aquavette" and "Evolution"