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Abstract

Engineering students at Lawrence Technological University participated in a unique and innovative learning experience in a joint venture between the College of Engineering and the College of Arts and Sciences. From the autumn of 2003 through the summer of 2005, the students planned, organized, and completed an historic 500-mile canoe trip from Detroit to Pittsburgh via Lake Erie to mark the 250th anniversary of the beginning of the French and Indian War (specifically the Battle of the Monongahela outside present-day Pittsburgh in 1755). The canoe expedition followed a route that was a standard trade and shipping route for the French and Native Americans up to the 1750s. Starting near the Lawrence Tech campus on the Rouge River in metropolitan Detroit, the students canoed into the Detroit River and along the length of Lake Erie. After several weeks of paddling Lake Erie, students portaged sixteen miles from Erie to Waterford, Pennsylvania (on French Creek), thereby passing from the Great Lakes to the Ohio River basin. They were the first people in modern times to make this historic portage, which was a key transportation link for the French colonial government and Native Americans in the region. The students then traveled down the Allegheny River to Pittsburgh, participating in commemorative events along the way.

The purpose of this project was to provide students with a multi-faceted out-of-class educational experience to better prepare them to be lifelong learners, problem solvers, and more well rounded citizens. From beginning to end, the students gained valuable life lessons and learned about teamwork, leadership, time management, fundraising, communication, history, engineering, social issues, environment, and the Great Lakes region in a fashion that is not conducive to traditional classroom instruction. In addition, students honed their engineering and problem solving skills by designing and building a 24-ft, six-person replica “Canoe du Nord” or North Canoe. With the aid of historical records, the canoe hull was designed using computer drafting software (Solid Edge). The canoe has the shape, size, and appearance of historic Great Lakes 18th-century birch-bark watercraft, but was constructed out of modern materials for durability and safety.

During the planning stages, students could earn up to six credits toward their degrees. Three of the credit hours (separated over three semesters) focused on entrepreneurial skills (logistical planning, leadership, teamwork, innovation, and fundraising) and counted as an engineering technical elective. The remaining three credits were for a course that studied historical, political, and technological aspects of the time period and region. In addition, students prepared for the endeavor by planning and participating in other activities, including lifesaving, physical fitness, logistics management, and route scouting. During the trip, there were additional educational experiences, including visits to historical sites, museums, cultural events, and libraries where students shared their experiences.
1. Introduction

In recent years, there has been a call to integrate more of the so-called “soft skills” into the engineering curriculum, including written and oral communication, time management, teamwork, and leadership. To be a successful engineer, these skills have been found necessary by engineering industry. Introducing core courses to the engineering curriculum (e.g., humanities, history, social sciences, communication courses) has been effective in alleviating the lack of necessary “soft-skills.” Unfortunately, the classroom is not always the best place to learn and practice these skills. Therefore, innovative techniques and out-of-class learning experiences are paramount to the engineering curriculum. They allow the student a broader stage and expanded time frame to reinforce and practice these important skills in “real-world” situations. Recently, Lawrence Technological University developed and implemented an especially innovative out-of-class learning experience.

Lawrence Tech is primarily an undergraduate institution with its motto being “Theory and Practice”. The university has four colleges: Architecture, Arts and Sciences, Engineering, and Management, but based on enrollment, it is predominately an engineering and architecture school. The school focuses on producing well-rounded graduates and encourages faculty to introduce innovative projects and learning experiences. Lawrence Tech has the flexibility to introduce innovative projects often through the use of technical electives, humanities/social science electives, and off-campus activities. One idea for an innovative learning experience was to organize and complete a high adventure expedition. Typically, projects of this nature are associated with K-12 organizations, but Lawrence Tech faculty modified the concept to be applicable at the college level. Faculty and students organized, planned, and completed an expedition from Detroit to Pittsburgh by canoe. The project presented students with a multitude of valuable life lessons. They learned about teamwork, leadership, time management, fundraising, communication, history, engineering, social issues, environment, and the Great Lakes region. The students also honed their engineering and problem solving skills in ways that are not possible in the traditional classroom. This paper outlines how this innovative learning experience delivered on these student outcomes. It also outlines some background and details of the “high adventure” project. The objectives of this paper are to describe how a project of this nature was completed, how it benefits student learning, and provides insight on how other universities can implement projects of similar nature.

2. Background for the Expedition Concept and Historical Perspective

The Detroit to Pittsburgh Canoe Project was not arbitrary in its creation; the timing and route were chosen to commemorate a historic event. Therefore, to fully appreciate the context and framework of the expedition, more detailed historical background is necessary.

In the 1600s, the British controlled the east coast of America while the French laid claim to a vast portion of North America, which encompassed the Great Lakes and virtually every bit of land west and north of the Appalachian Mountains. Contained in the region were great quantities of thick-furred mammals including beaver. Beaver pelts were highly valued to support a European fashion trend of fur-felt hats. Therefore, America’s interior was also highly valued.
Fur traders and trappers forged much of the original network of trails and waterways to open the region (see Figure 1). They established a network of roads, waterways, and trails as communication and trade links to the American east coast. The birch bark canoe was their major mode of transportation. The French established a series of forts along the trails and waterways to both guard the land and to serve as trading outposts. Two forts are noteworthy in context for the Lawrence Tech project. At the junction of the Ohio, Allegheny, and Monongahela Rivers where present-day Pittsburgh is located, Fort Duquesne was established. Fort Pontchartrain was established in present-day Detroit.

Figure 1. Modern map of the French and British disputed land (including Pennsylvania, Ohio, and Michigan) with the approximate route of the Detroit to Pittsburgh Canoe Expedition.

The land stretching north from the Ohio River up the Allegheny was hotly disputed by the French and British. In 1752, the Marquis Duquesne was made governor-general of New France with specific instructions to take possession of the Ohio Valley, removing all British presence from the area. The following year, he sent troops to western Pennsylvania where they built new forts at Presque Island (Erie) and on the Rivière aux Boeufs (Waterford). At the same time, Robert Dinwiddie, Lieutenant Governor of Virginia, was granting land in the Ohio Valley to citizens of his colony. Dinwiddie, hearing of new French forts on the upper Allegheny River, sent out a young Virginia officer, George Washington. In the autumn and early winter of 1754, Washington traveled from Virginia to Fort LeBoeuf to deliver a letter demanding that the French leave the region. The spring and early summer brought no exodus of the region from the French, so the British marched an army west under General Edward Braddock toward Fort Duquesne
(present day Pittsburgh). The French force met the British in battle on July 9, 1755 near the fort on the banks of the Monongahela River. The British were defeated and Braddock was killed thus marking the beginning of the French and Indian War.

In the Spring of 2003, Philip Vogt, Associate Professor of Humanities, noticed that the highly technical Lawrence Tech students should have an opportunity to further their appreciation of the natural beauty and history of the Great Lakes region. Realizing that July 9, 2005 would mark the 250th anniversary of the outbreak of the French and Indian War, he proposed an educational expedition that would follow the historical route in a replica birch bark canoe and take part in the 250th anniversary commemorative events near the battle site. The endeavor is known as the Detroit to Pittsburgh Canoe Project.

It should be noted that any university can implement a project of similar nature with an historical expedition component to allow their students an out-of-classroom innovative learning experience. For example, a southern university can follow the routes of Hernando De Soto (for the 500th anniversary!), or a university in the Rocky Mountain west can journey the explorations of John Wesley Powell down the Colorado River.

3. Organizing and Planning

The project took 20 months of organizing and planning encompassing 5 semesters (Fall 2003; Spring, Summer, Fall 2004; Spring 2005). The expedition from Detroit to Pittsburgh occurred during the summer of 2005. During the fall of 2003, three faculty members volunteered to serve as project advisors: Donald Carpenter, civil engineering; Andrew Gerhart, mechanical engineering; and Philip Vogt, humanities. Besides being university instructors, each advisor had some special expertise that was highly valued for the project. Dr. Carpenter is a water resources specialist familiar with the Great Lakes. He is also an avid canoeist, outdoorsman, and an Eagle Scout with a love of history and many years of student advising. Dr. Gerhart is an avid outdoorsman, an Eagle Scout, a Boy Scout troop leader, and an historical re-enactor (1750s through 1890s). Dr. Vogt is an historian with an astute skill for organization. The advisors decided that a replica canoe would be designed and built by the students and that students could earn credit toward their degree for project work. The advisors and students decided other aspects of the project together. Involving the students in the planning process was not only necessary, but allowed them to take ownership of the project.

In the fall of 2003, the idea of the trip was proposed to the students, faculty, and staff at a series of meetings. Approximately 30 students expressed interest in the project. The advisors soon discovered that the number of students truly interested would drop quickly over the next few months; once the students discovered the time commitment, the amount of work involved, and the possibility of giving up a portion of a summer job, the number of students dropped from 30 to around 17. Surprisingly, all but one of the remaining students were from the College of Engineering. Of the 17, only four made the entire voyage, with six others completing various sections. The remaining seven students assisted in the planning and support, but never participated in the traveling component of the project. The following paragraphs describe some of the effort (and obstacles encountered) to plan for and conduct a major expedition.
In preparation for the trip, various courses were arranged for the students that could be used toward their degree. A student could earn up to 6 credit hours that were directly related to the project. A three credit upper-level humanities course was offered to fulfill the Junior/Senior humanities requirement. The course was titled “Technology and the North American Environment in Historical Perspective.” The students engaged in research and discussion relevant to the project. After an initial common reading that introduced students to overarching theoretical issues within the field of environmental history, each student selected one of six reading/research paths: (1) Industrial Revolution, (2) Political Trajectories, (3) New France, (4) Amerindian/European Encounter, (5) French and Indian War and (6) American Revolution/War of 1812. The final papers applied, and responded to, the theoretical issues raised in the first segment of the class.

In addition to the humanities course, three one-credit courses were held in Spring ’04, Fall ’04, and Spring ’05 semesters. The total of the three credits counted as a technical elective in the engineering curriculum. Multiple outcomes were realized through the three credits. First, the students defined the aspects, goals, and outcomes of the trip. Second, the students planned various aspects of the trip. To do this, the students were broken into nine teams with students serving on two or more teams. Those teams were Route Planning/Logistics; Sponsorship/Fundraising; Public Relations and Media; Canoe Replica; Physical Conditioning; Safety; Historical Interpretation; Off-Water Transportation; and Gear, Food, & Sanitation. Third, the course allowed for interesting lessons from guest speakers. For example, a speaker from the Rouge River Project discussed the environmental restoration of the Detroit area waterways. Other presentations included fundraising, Pennsylvania waterways and environment, how to speak for media interviews, canoeing technique, and expedition organization. Fourth, students were asked to keep log books of their planning. Finally, teambuilding exercises were conducted.

To address entrepreneurial skills such as marketing, organization, and capital acquisition, the students were responsible for fundraising a significant portion of the project. This was accomplished with close guidance from the Office of University Advancement as well as with assistance from faculty advisors. The overall budget for the trip was $55,000, which included support vehicles, the cost of building a replica canoe, equipment, and daily trip expenses (lodging, food, fuel, etc). Neither the team participants nor the faculty/staff support were compensated as part of the project so there were significant volunteer hours involved as well which are not included in the budget. Initially, the faculty advisors approached numerous private foundations to underwrite a significant portion of the expedition, but those efforts were unsuccessful. Therefore, the students generated a fundraising brochure (Appendix A) and approached over 120 local engineering companies, national and local outdoor equipment suppliers, and personal contacts. In addition, internal University sources for funds were approached as well. From these efforts, the students successfully raised approximately $33,000 in cash, which included $19,000 from internal University sources (College of Engineering Alumni Fund; College of Arts & Sciences Alumni Fund; Department of Humanities, Social Sciences and Communication; and a competitive student venture fund) and a large donation from UGS whose Solid Edge software was used to design the replica canoe. In addition, the University was also able to secure the use two 2006 SUVs from Ford Motor Company (through a generous three month free lending agreement) to support the trip. There were several equipment
donations from local boat suppliers as well, but less equipment was donated than expected. A complete list of sponsors can be found in Appendix B.

In the end, fundraising was perhaps the most difficult component of the trip with funding still being obtained in the month prior to departure. The faculty advisors and the Office of University Advancement anticipated that the innovative nature of this student project would appeal to many corporations and foundations; hence the fundraising should be easy. In addition, fundraising efforts began 18 months before expedition launch, which afforded plenty of time to raise the money necessary. Unfortunately, the opposite was true. The unique interdisciplinary nature of the project was hard for many organizations to comprehend and limited the number of donations. In addition, many of the outdoor equipment suppliers focus their giving efforts on K-12 programs and could not (or would not) donate to a University program. The lack of equipment donations from large outdoor equipment suppliers was specifically surprising. In the end, internal fundraising by the team provided to be the most fruitful endeavor, and we would recommend to anyone planning a similar endeavor to have funding secured in advance.

During the planning stages, many off-campus preparation activities were necessary. To reinforced the skills of organization and planning, the students drove portions of the route one year before the expedition. They traveled across southeast Michigan, northern Ohio and western Pennsylvania to scout the route, identify campsites, and explain the project in communities along the way. They also met some of the various folks along the route that had agreed to help including French and Indian War re-enactors, Coast Guard personnel, and various harbor/boat ramp operators. In addition, the students practiced canoeing and camping skills in southeast Michigan and canoed sections of the route to determine feasibility. Two students went on a three-day canoeing trip (in 1750s style) down the Clarion River in Pennsylvania with a group of historical re-enactors, the Compagnie Franche de la Marine de la Riviere au Boeuf (the Compagnie LeBoeuf, http://members.tripod.com/frenchmarine/). Through these experiences, the students determined a list of necessary camping, canoeing, and safety gear for the trip.

While planning the route and itinerary, many obstacles were encountered. The students wanted to camp outdoors as much as possible during the expedition. Unfortunately, campsites within a reasonable driving distance of the waterways are more rare than one may think. In fact, in a few places, camping is non-existent (e.g., at Cleveland, midway down the Allegheny River, etc.); therefore, few nights were scheduled for hotels. Scheduling campsite and hotel reservations was not easy. Because of the possibility of inclement weather, unplanned rest days, or illness, the team could never predict with certainty where they would be on a particular day. There was typically an estimated location per day but we had to allow for 2 days ahead or behind schedule. In hindsight, most of the reservations were met exactly as reserved and for those that could not be met exactly, the hosts were gracious with their flexibility.

The students also wanted to ensure that the trip was continuous (i.e., no segments were skipped). Launching and landing locations with a navigable road and boat ramp had to be located at reasonable intervals. Finding the ramps was accomplished with detailed maps and some physical scouting (often the night before). In addition, the route took the team past three nuclear power plants and an Army test firing range. The U.S. Coast Guard was asked to escort the canoe past these high security/dangerous areas. Unfortunately, the Coast Guard could not accommodate our
flexible schedule. Instead the power plants and firing range security officers were alerted ahead of time, and they graciously allowed passage under strict conditions (e.g., no cameras). This granting of passage is uncommon, as typical watercraft must stay out of the power plant security zone. Because of the nature of the journey, the power plants made exceptions. Also to maintain trip continuity, the students researched locks and dams that would be encountered on the Allegheny River. Other than being aware of the lock operation schedule, passage for small watercraft proved to be no problem.

During planning, the advisors made it very clear that safety was paramount. As a result, the students gained some life-long benefits. Three students and one advisor completed Red Cross Lifeguard/Lifesaving Certification. Each student was required to pass a Red Cross certified swimming test. Prior to the trip, each student visited a physician to get a health check-up, and signed health documentation was returned to and retained by the faculty advisors on the trip. Consequently, a few students started and have maintained a physical fitness regimen. Many additional safety precautions were taken. Marine emergency and safety radios were carried, and marine forecasts were consulted before paddling began. Every canoeist wore a life jacket at all times when on the water, and life saving throw ropes were easily accessible. Cell phones, two-way radios, and well stocked first-aid kits were also carried on-board. Two students were already Red Cross Lifeguard/Lifesaving certified. Liability waiver forms were signed by the students. Finally, there was a support van that aided with navigation and communication, and carried supplies, instructional materials, and U.S. Coast Guard station phone numbers for the canoeists.

The students learned the value of proper communication. They worked closely with the Lawrence Tech Bureau of News and Media Affairs throughout the project. The media in local communities was alerted to aid in the publicity of the expedition. Also, a flyer was produced (see Appendix B), and a website was developed and maintained at Lawrence Tech for general information, fundraising, and for updates on the trip (in the form of a journal).

Communication skills were further practiced by the students with another major component of the project; public oral presentations with the aid of PowerPoint were delivered by students and faculty along the route. Many organizations, such as state parks, museums, educational facilities, and city chambers of commerce, were alerted that we would be passing by during the expedition and were presented with the possibility for the team to give a presentation. Twenty-one presentations were made over the course of 59 days (and many of these places offered free camping in exchange for the presentation). The topics presented and discussed during the presentations presented a great learning opportunity for the students. They studied topics that they would not typically learn about in a standard engineering curriculum. The presentation topics included: what the trip is about and why they were doing it; an historical briefing; and how the Great Lakes region has changed culturally, socially and environmentally. A general question/answer session followed which further enhance their impromptu communication skills. As an interesting aside, the male presenters dressed in 1750s period clothing and displayed some of the implements used by the fur traders.

As the trip drew near and the students’ schedules of availability were mapped, the team realized that more help was needed to drive the support vehicles. To alleviate the situation, the students’
problem-solving skills were tested. The canoe need a minimum of five paddlers for operation and one person was needed on-land as support, although it was optimum to have six in the canoe and two on land. Therefore, Lawrence Tech staff and families of the student participants were invited for short intervals during the trip. Since we had two expedition vehicles, one could be used as the support vehicle. The other vehicle acted as a shuttle between Lawrence Tech and the canoe team; as one support person left the team to drive back home, the next support person could jump into his/her place, get instructions, and go meet the team.

4. The Birch Bark Canoe Replica Design and Construction

The birch bark canoe was the major mode of transportation for the trappers and traders of the 1750s. Built from readily available native materials and based on craft built by the Native Americans, the canoes were strong but lightweight. The canoes were built from a compression-loaded frame consisting of multiple bowed wooden ribs bound together to a gunwale with dried reeds. Several layers of thin but water-proof birch tree bark was stretched around the frame and stitched together and to the frame. The stitched seams were sealed with pine pitch or a tar mixture. The canoes were built in various sizes that have been divided into three categories. The Canot du Maitre (or Montreal Canoes) were designed to handle the dangerous waters of the Great Lakes, were 25 to over 40 feet long, and could carry four tons of cargo. The Canot du Nord (or North Canoe) had an average length of 18 to 25 feet. It would hold 4 to 6 passengers plus their gear and additional cargo or roughly 3000 pounds. Smaller canoes (native of river canoes) for 1 to 3 passengers were also built for general transportation and they are roughly of the size and shape of modern recreational canoes.

For the 2005 expedition, based on budget, maneuverability, and team size, a six-person North Canoe was chosen as the replica watercraft to be built and to complete the entire route. In addition, there were a few portions of the trip when more than six people were paddling which meant that a modern 2-person canoe accompanied the replica. To enhance the engineering element of the learning experience, the advisors decided that the canoe should have the appearance of an eighteenth century birch bark canoe but should be designed and built with modern engineering techniques and materials. This would also provide extra durability and safety. It is common for historical re-enactors to also use modern watercraft painted to look authentic since it is difficult to build and maintain birch bark craft.

A group of students visited a company near Chicago that builds birch bark canoe replicas. The students also did extensive research to determine dimensions, styles, and construction techniques. Solid Edge software (by UGS) was used to render a precise model of the canoe (see Figure 2). The computer model was then used to form the mold around which the canoe was built. Using Solid Edge and a large plotter, a full-sized section view was printed for each linear foot of the canoe. The paper plots were cut-out and attached to wood sheets that were then cut to size. The wood sections were mounted on a common surface called a strong-back (see Figure 3). Cedar strips (¼ inch by ¾ inch) were shaped around the forms glued together and stapled in place to form the hull (see Figure 4). Once the glue dried, the staples were removed. Laminated 1/8 inch by 2 inch strips of ash were used for ribbing inside the cedar hull. Oak was used for the gunwales, thwarts, and seats. Laminated birch was used for the end caps. The inside of the boat was covered in one layer of 5 oz. fiberglass cloth and West System epoxy resin mixture intended
for marine use (see Figure 5). The outer surface of the canoe used two layers. The inside and outside of the canoe was painted with a marine paint base coat and then a birch bark pattern was added (see Figure 6). Simulated pitched seams were painted and finally a clear protective polyurethane coating was applied. The final canoe is 24 feet long, 4 ½ feet wide, roughly 400 pounds empty, and seats 6 people (see Figure 7). The draft (depth of canoe under water) is nominally 4 inches when empty and estimated at 7 inches when loaded with nearly 2000 pounds. The entire design and construction took 4.5 months. The canoe can maintain a velocity of 4 to 5 knots with six experienced paddlers in windless conditions on calm water. Finally, a trailer was modified to tow the craft.
5. The Expedition

A. Overview

The estimated distance to be traveled from Detroit to Pittsburgh was 488 miles. This was determined by meticulously plotting over 1000 points on mapping software from a global positioning system (GPS). This distance would be covered in 59 days from May 14 to July 9. During the duration of the trip, rest days and/or bad weather days were figured to occur every fourth day. Therefore, nine miles per day on the water was to be paddled. This is purely an average. When paddling downstream or on calm open water, the team could travel over 25 miles. Other days with high headwinds/crosswinds or large waves, only a few miles could be completed. A support vehicle was always nearby the canoeists to put the boat in the water and retrieve it each day.
B. The Actual Route Navigated

The launch ceremonies took place on May 14 two miles from the Lawrence Tech campus on the Main Branch of the Rouge River in Southfield, Michigan. The Detroit news stations were in attendance as well as some French and Indian re-enactors to fire off a musket volley and a cannon. In addition, a minister blessed the boat for a safe journey. Originally it was hoped that the expedition could begin from the launch site since the Rouge River flows into the Detroit River and onward into Lake Erie. Unfortunately, the team could only paddle a couple of miles on the first day, because a portion of the Rouge River was not passable that week for multiple reasons. First, the replica canoe is too large to navigate the small river. Second, even using 2-person canoes, the river was running too high on the day intended for its passage, presenting a danger to the canoeists. Finally, after heavy rainfall, the combined sewer overflow dumps into the river. Pollutants are left behind after this occurs. As there was some heavy rain the night before the launch, the risk of full-body contact with the river water was too high. Officially, the team began the continuous journey 4 days later in the Detroit suburb of Melvindale on the lower Rouge River. This is a portion of the Rouge River that is channelized (bottom and sides are concrete) and clear of debris. From there, the team canoed down the Rouge into the Detroit River and continued downriver into Lake Erie (see Figure 1).

After several weeks of paddling the southern shore of Lake Erie (Figures 8), the students hiked the sixteen-mile portage from Erie (Fort Presque Isle) to Waterford (Fort LeBoeuf), Pennsylvania (on LeBoeuf and French Creek), thereby passing from the Great Lakes to the Ohio River basin. The team, accompanied by the Compagnie LeBoeuf re-enactors, were the first people in modern times to make this historic portage, which was a key transportation link for the French colonial government and Native Americans in the region. The students then traveled down the LeBoeuf Creek and French Creek into the Allegheny River (see Figure 9). The Allegheny River has its terminus at “The Point” in Pittsburgh. “The Point” is the confluence of three rivers, the Ohio, Allegheny, and Monongahela, which form an actual point of land. This is where Fort Duquesne was located and where the Lawrence Tech expedition officially ended. The final distance completed by canoe (with the sixteen mile portage on foot) was almost exactly 500 miles as recorded by the GPS. The additional 12 miles unaccounted for in the planning was due to backtracking in and out of harbors as well as some weaving in the canoe path: only a 2.4% uncertainty!
C. Team Structure

The faculty advisors did their best to ensure that the students were leading and organizing the expedition. Student crew leaders were arranged before the trip. Any student that wanted to serve some time as a crew leader was given the opportunity to do so. The maturing of leadership skills of the students was obvious as the trip progressed.

D. Highlights

Space does not allow all of the noteworthy events and subsequent student learning outcomes encountered during an eight week expedition, but a few of the highlights are recounted. For a comprehensive story, go to http://www.ltu.edu/canoe_trip/journal.asp.

First and foremost, the generosity of the American people was outstanding. Folks who knew nothing about our expedition, other than that we were paddling from Detroit to Pittsburgh, went out of their way to lend a helping hand, offer food or gear, or invite us to special occasions. One poignant display of generosity occurred near the beginning of the trip; a boat repair shop spent six hours altering the canoe trailer for stability and ease of use – free of charge! The students learned the value of generosity from these experiences.

Very obvious were the changes in landscape, both from a spatial and temporal perspective. The students learned valuable lessons in history and social impact on the environment as they recognized these changes. Spatially the landscape changed from urban surroundings to industrial settings to wooded scenery within only a few miles. The heavily industrial landscape of the Rouge and Detroit rivers was an extreme contrast to the peaceful wooded Allegheny Mountains of western Pennsylvania. Temporally, in the 1750s the entire route would have been backwoods frontier. None of the route would have had industry and only small urban settings would have been encountered. The only human presence would have been Native Americans, European soldiers, and very few American colonists. Today, there are towns and large cities every few
miles. The team passed the major cities of Detroit, Toledo, Sandusky, Cleveland, Erie, and Pittsburgh. Scattered throughout the journey were modern hazards such as concrete, manmade breakwaters, dilapidated piers, rusting metal, and barge traffic. By contrast, the eighteenth century fur traders’ hazards included unknown weather fronts, savage fauna, hostile natives, starvation, and exposure. The team had the benefit of weather forecasts, water wave height data, numerous grocery stores and restaurants, modern expedition clothing, etc.

The public presentations were relatively well advertised and had an average of 20 in attendance. The smallest audience was four while the largest was over 30. The quality of the presentation improved slightly over the course of the trip, but more importantly, the students ease and comfort in front of an audience increased greatly (see Figure 10). Their ability to quickly and accurately answer audience questions greatly improved. In addition to the formal presentations, the students had many opportunities to visit with and speak to large groups of K-12 students (see Figure 11). These visits served as an excellent venue for the LTU students to hone their speaking skills and recognize the satisfaction and importance of educating others through outreach.

The students had the opportunity to visit multiple museums and educational facilities such as the University of Toledo Lake Erie Research Center, Inland Seas Maritime Museum, Lake Erie Nature and Science Center, Fairport Marine Museum, Great Lakes Marine and Coast Guard Memorial Museum, Erie Maritime Museum and Bayfront Center for Marine Studies, and Fort LeBoeuf Museum. They visited lighthouses and were given the opportunity to captain a large sailboat. They experienced eighteenth century food (i.e., muskrat stew, venison sausage, boiled parsnips, pheasant soup, peas porridge, game jerky), shot eighteenth century flintlock muskets and pistols, toured the War of 1812 flagship Niagara of Oliver H. Perry, and slept under the stars. One student kept an electronic log/diary of the trip. She was always keeping watch for a public library where she could send her daily entry over the Internet for posting on the university website (http://www.ltu.edu/canoe_trip/).

Teamwork played a crucial role from a scheduling standpoint. To keep on pace to complete the journey, the students recognized that each person played an important role in operations and that they must trust one another to complete all of the daily tasks. Some of these tasks included checking maps for boat ramps, tearing-down and setting-up camp, preparing meals, scouting...
ahead for the location of the evening presentation, checking the weather, and even locating showers.

Even though the students operated very well as a team, there was surprisingly little time for relaxing. Originally, the team had planned on several “tourist” activities such as a visit to Cedar Point Amusement Park and traveling by ferry to Put-in-Bay, Ohio on South Bass Island. In fact to keep on schedule, only three extraneous activities occurred: visits to a small water-themed amusement park, the Rock and Roll Hall of Fame, and a Cleveland Indians game. Nevertheless, the students learned that alternate, less lengthy morale-boosting activities (e.g., volleyball games) must take place during a major project or else teamwork will quickly deteriorate.

One notable highlight of the journey featured a race of the Lawrence Tech replica canoe with the Cleveland Metro Parks replica canoe. The Cleveland canoe was smaller and entirely fiberglass which made it much lighter with less draft. There were also fewer paddlers on-board. Needless to say, our hefty Canoe du Nord could not keep pace with the lighter canoe.

A historical highlight was the portage from Erie (Fort Presque Isle) to Waterford (Fort LeBoeuf), Pennsylvania (on French Creek). The portage took the team over series of ridges which allowed passage from the Great Lakes basin to the Ohio River basin and, as was noted earlier, was the first people in modern times to make this historic portage. The team was accompanied by the Compagnie LeBoeuf re-enactors who also helped plan the route to most closely follow the historical portage. Like the re-enactors, the male students and faculty advisors hiked the route in historical replicas of 1750s clothing. The 2005 portage followed paved roads much of which follow the eighteenth century path (Figure 12), but segments of the original path lie on private property or dangerous ground. The group was escorted by the police and fire department for safety. The hike was split between two days mostly because of the summer heat, but also because the original portage was often completed in two days. At the overnight camp in the middle of the portage, the students experienced history and culture as they were treated to historical music, flintlock musket and pistol shooting, eighteenth century food, and other historical activities.

![Figure 12. Historic portage on modern routes](image-url)
Toward the end of the trip, we were invited by the Steel City (Pittsburgh) Dragon Boat Team to paddle along with them in their Dragon Boat (http://steelcitydragons.org/). Dragon Boats are sleek, 21 person, fiberglass canoes based on legendary Chinese boats. The teams compete nationally with other cities. It was very difficult to learn the racing-style of paddling a Dragon Boat after using a traditional feathering-paddle style for 500 miles. The team could “sprint” the boat at nearly 12 knots.

The team reached The Point in Pittsburgh on July 8, 2005, one day ahead of schedule. The following day, the team took part in the festivities commemorating the 250th anniversary of the beginning of the French and Indian war. These festivities took place on the site of Braddock’s defeat at the Battle of the Monongahela which is now covered by the post-industrial town of Braddock.

![Figure 13. Final destination – The Point (skyline of Pittsburgh visible in background)](image)

6. The Value

A. Students

The students that both planned the trip and participated in at least one week of the journey ranged in age from 19 to 22. The authors noticed substantial growth in these students, since the students were challenged physically, intellectually, emotionally, and socially.

Physically the students endured the 500-mile journey itself. For over a month, the choppy water of Lake Erie with no prevalent current required strenuous paddling. As noted above, the sixteen-mile portage in northeastern Pennsylvania was done in eighteenth century clothing (e.g., long pants and sleeves made from wool, heavy cotton, and leather) in humid summer weather with temperatures over 90 degree Fahrenheit. Also the students endured the rigors of long-term
outdoor living which includes weathering the elements (e.g., high winds, thunderstorms), sleeping on the ground, and cooking under a tarp.

Intellectually, the students met many challenges. First, the team interacted with multiple experts on the 1750s time period. While the students had some rudimentary knowledge of the time period, they were challenged to gain and retain new information so that it could be used later in the trip to answer the public’s questions. Also, through practice, the students gained an intellectual understanding of team operations, leadership, entrepreneurship, navigation, watercraft skills, camping/outdoor skills, time management, design, fabrication, and environmental issues.

The students were challenged emotionally in three distinct ways. First, the students lived closely (ate, slept, played, and worked) together 24 hours a day for two months. The team was a diverse group of students, staff, and faculty, which could create much tension during the grind of daily operations. As expected, the students took time to adapt to different personalities and viewpoints. Second, the students had to cope with monotony. The Lake Erie scenery was often very uniform, and after paddling for hours with the same group of people, conversation would run dry. The students became very good at focusing inward with their thoughts and settling their emotional well-being. Third, the students were almost always “in the spotlight” which is tough to deal with over a two-month span. It is hard to hide or get-away when you are paddling a 24 foot birch bark canoe or camping in the front yard of a museum on the main street of a town. The team was a focal point of large public events such as the North Coast Harbor Boating, Fishing, and Seafood Fest in Cleveland and at the Kittanning/Ford City Fourth of July Celebration. Continually, the newspaper and TV reporters were advertising where the team was and what it was doing, so people would come constantly to meet the students. It was obvious by the end of the trip that the students needed some time to rest (emotionally) when they returned to Michigan. Ironically, several of them went camping when the team returned to “get away” from civilization.

The students gained a tremendous social awareness through the challenge of visiting so many different people and communities. The people encountered included backwoods outdoor enthusiasts, white collar professional urbanites, eclectic history buffs, blue collar fisherman and barge operators, politicians, young children, roguish teenagers, and even a few mentally challenged people. It was all of these people that helped make the trip especially enjoyable and broadened the horizons for the students.

From beginning of planning to the end of the trip, the students gained valuable life lessons from this out-of-class educational experience. It is difficult to list all that was learned but the highlights include learning about teamwork, leadership, planning, communication, history, engineering, design, problem-solving, fabrication techniques, entrepreneurship, social issues, the environment, the region, culture, heritage, safety, changing technologies, time-management, and organization.
B. The University

Lawrence Technological University greatly benefited because of the abundant media attention including newspapers, magazines, television, radio, and the Internet. It is estimated that over a million people heard about Lawrence Tech because of this project. Lawrence Tech and the project were featured in 54 different newspapers and other published printings. Features in major newspapers such as the Detroit Free Press and News, the Cleveland Plain Dealer, and the Pittsburgh Post-Gazette were major contributors to helping us reach a broad audience. The project was also featured on nine broadcasts (television and radio). In addition, the team received a student design award from UGS (the producers of Solid Edge software) for an innovative student design project and were featured during the annual Solid Edge Users Conference in Cincinnati, Ohio in September of 2005. Unfortunately, it will be impossible to know if student enrollment in engineering and at Lawrence Tech from the regions through which we passed will increase because of the project.

C. The Communities

The communities that we passed through benefited from this project. With 21 presentations, media coverage, and general novel attraction, we drew attention to the historical heritage, geography, and natural beauty of a region marked by intensive industrial exploitation and subsequent industrial decline, where both heritage and beauty are too easily (and too often) overlooked. The public was especially surprised to learn that the students were working toward engineering degrees. This type of project is just not expected by society from engineering students.

7. Conclusion

A few logistical lessons were learned from the experience that need attention for any similar future project. First, the time and effort necessary to make the trip successful was sorely underestimated by the advisors and students. While this paper discussed many of the issues involved in planning and executing such an expedition, many of the intricacies of such an undertaking are overlooked. Any faculty advising such a project should consider release-time from their standard professional responsibilities. Student participants should consider lightening their course load.

More students and university staff are needed for a project of this magnitude. While the exact number of participants would vary depending on the scope of the project, the Detroit to Pittsburgh project could have benefited with at least five more dedicated students for the planning and trip and at least 3 more staff during segments of the trip. This may have alleviated the strenuous time and effort problem.

Finally, the number of presentations needs to be balanced with the number of participants. Some of the evenings need to be dedicated to cooking, resting, or setting-up a new camp. Having a presentation more often than every third day does not allow for this. It is difficult not to
overbook presentations because of the benefit to the students and the public, and because we received free lodging in exchange for the presentation. With a larger team, perhaps the presentations can be as numerous as we had them.

Despite the hardships and lessons learned, the actual expedition was a once in a lifetime experience that was not only highly valuable, but exceedingly fun. The students were provided with a multi-faceted out of class educational experience to better prepare them to be lifelong learners and more well rounded citizens. In addition, students honed their engineering and problem solving skills by designing and building a 24-ft, six-person replica “Canoe du Nord” or North Canoe. From beginning to end, the students gained valuable life lessons in a way that is just not possible in a traditional classroom.

Acknowledgements
The authors thank Dr. Philip Vogt of the Lawrence Technological University Humanities Department for the initial concept, his contribution as one of the faculty advisors, and for accompanying the students for the entire expedition; the students for their perseverance and youthful vigor; and to the hundreds of people and organizations that contributed time, money, materials, and talent to make this project a reality.

References
WHAT CAN WE DO FOR YOU?

Now that you know what you can do for us, what can the Lawrence Tech Detroit to Pittsburgh Canoe Team do for you?

- ALL sponsors will be listed in published materials and on a banner to be carried on the trip and displayed at each stop.
- Sponsors at Levels 1 and 2 will be specifically recognized in print and press releases.
- All donations to Lawrence Technological University are tax deductible.

GIVING LEVELS

Giving Level 1: Lake Erie $10,000
You get:
- Large Decal/Logo/Name on Logo Canoe
- Large Decal/Logo/Name on Banner
- Commemorative Haque
- Logo/Name on Back of Trip Shirt

Giving Level 2: Rouge River $5,000
You get:
- Medium Decal/Logo/Name on Logo Canoe
- Medium Decal/Logo/Name on Banner
- Commemorative Haque
- Logo/Name on Back of Trip Shirt

Giving Level 3: Alleghany River $2,500
You get:
- Small Decal/Logo/Name on Logo Canoe
- Medium Decal/Logo/Name on Banner
- Commemorative Haque
- Logo/Name on Back of Trip Shirt

Giving Level 4: Detroit River $1,000
You get:
- Name Listed on Logo Canoe
- Small Decal/Logo/Name on Banner
- Commemorative Haque

Giving Level 5: French Creek $500
You get:
- Name Listed on Banner

Giving Level 6: LeBoron Creek $100
You get:
- Name Listed on Banner

DETOU TO PITTSBURGH
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Detroit to Pittsburgh
Canoe Trip
2005

Commemorating the
250th Anniversary of the
French and Indian War
A CENTURIES-OLD ADVENTURE

In the summer of 2005, students from Lawrence Technological University will recreate an historic canoe trip from Detroit to Pittsburgh via Lake Erie to mark the 250th anniversary of the French and Indian War. In the 18th century, the French and Native Americans used the waterways from Detroit to Pittsburgh as primary trade routes.

Lawrence Tech students will be the first people in modern times to make this historic voyage. The 6-week trip was two years in the planning and is being implemented largely by students. The student team will depart in May of 2005 from Lawrence Tech’s campus and arrive in Pittsburgh on July 9, 2005, the anniversary of General Braddock’s defeat in the Battle of the Monongahela at Pittsburgh. The trip will be coordinated with historical reenactments and other commemorative events celebrating the anniversary.

HISTORY

In 1750, British and French representatives met in Paris to try to solve territorial disputes, but no progress was made. In 1752, the Marquis Duquesne was made governor-general of New France with specific instructions to take possession of the Ohio Valley, removing all British presence from the area. The following year, he sent troops to western Pennsylvania where they built forts at Presque Island (Erie) and on the Rivière aux Boeufs (Waterford). At the same time, Robert Dinwiddie, Lieutenant Governor of Virginia, was granting land in the Ohio Valley to citizens of his colony. Dinwiddie, hearing of new French forts on the upper Allegheny River, sent out a young Virginia officer, George Washington, to deliver a letter demanding that the French leave the region, setting in motion the events which inevitably led to the French & Indian War.

Info from: http://www.phlaprintshop.com/frenchw.html

TEAM GOALS/BENEFITS

Beyond making history and celebrating the anniversary of the French and Indian War, students embarking on this project are gaining out-of-class knowledge and experience in:

- Teamwork
- Leadership
- Communication
- Engineering
- Environment
- History
- Organization
- Logistical Planning
- Physical Fitness/Endurance

SAFETY

Safety is the number one priority for an adventure such as this. All participants are competent swimmers and a number have also received their life-saving certification. Safety being priority one, everyone on the trip will be equipped with appropriate safety equipment, including flotation devices. In addition, the Coast Guard will be periodically notified of our location along the route and we will proceed accordingly under their discretion.

WHAT CAN YOU DO TO HELP?

Now that you are interested in contributing, you must be wondering “What can I do to help?” There are several options available to sponsor our team and help us reach our fundraising target of $55,000. These include:

- Equipment Donations
- Donations of Supplies
- Cash Donations
Lawrence Tech Detroit To Pittsburgh Canoe Trip Brochure

Commemorating the 250th Anniversary of the French and Indian War

This summer Lawrence Technological University students and faculty are traveling from Detroit to Pittsburgh via canoe, following one of the main trade routes used by Native Americans and French voyagers in the 1700s. Not only are they learning about history, they also are making it.

The interdisciplinary team, representing departments ranging from humanities to civil and mechanical engineering, began their eight-week journey on May 14, first canoeing down the Rouge River in southeastern Michigan from a point near the University’s campus in Southfield, then into the Detroit River, and on to Lake Erie.

After several weeks of paddling along the Lake Erie shore, the team will become the first individuals in modern times to make the historic 14-mile portage to Waterford, Pennsylvania, linking the Great Lakes with the Ohio River basin. Back in the water, they will follow LeBoeuf Creek to French Creek and finally to the Allegheny River and Pittsburgh, where the trip culminates on July 9, the 250th anniversary of the Battle of the Monongahela, which took place nearby and in which the British General Edward Braddock was defeated by French and Indian forces.

MAKING HISTORY

Two years in the planning, the canoe trip project has been almost entirely student initiated and managed. Not only did team members design and build the 24-foot-long replica of a birch-bark fur traders’ canoe in which half of them are traveling (accompanied by modern canoes), they also sought out sponsors and raised the $33,000 needed to cover the cost of the trip, designed a webpage, built a trailer to aid in the portage of the canoes, organized on-the-water practices, and mapped the route.

ABOUT THE CANOE

Junior mechanical engineering student Mike Moraes designed the canoe using computer-aided engineering design software, a book on canoe building, Internet research, and notes he took during a meeting with a master canoe builder. Although the replica is the same shape and size as its historical predecessor, for reasons of safety and

FUN CANOE FACTS

- Design and construction took over 1,000 hours
- 3,200 linear feet of cedar were used in the 160 strips that form the mold
- Final weight: 500 pounds
- Capacity: up to 8 paddlers and up to 1,200 pounds of gear

TEAM MEMBERS
- Adam Andruher
- Jason Dauphley
- Laura Hahm
- Joe Hardy
- Debbie Janiet
- Chris Jarzawa
- Stan Korak
- Mike Matsus
- Chris Noda
- Wayne Ronad
- Will Rupiper
- Chris Trincale
- Matt Wiesl

FACULTY ADVISORS
- Dennis Carpenter, civil engineering
- Andy Gauthier, mechanical engineering
- Phil Vogel, humanities

SPONSORS
- $500 - $1,000
  - GENIE International America, Inc.
  - Ford Motor Company
  - Lawrence Technological University
  - College of Arts and Sciences
  - College of Engineering
- Alumni Association
- Department of Humanities, Social Sciences, and Communication
- Bank of America Foundation Student Venture Grant

- Under $50
  - Bruce Knecht, Jr.
  - Red L.L.S.
  - Great Lakes Docks & Docks
  - Dave Langharrm
  - Lawrence Technological University
  - Alumni Association
- Under $100
  - NTH Consultants
  - Orchard, Hill, McLernon
  - Matson Perry
  - Shainline USA
  - Valley Eye Center
  - Waterloo

GIVING CREDIT
- Susan McCoy
- Rhoda Cullen Traders
- Karen Fedor
- Traverse Lake Golf Club
- Hugh Halabi
- Omer Kaminos
- KDPI
- Lodge Cast Iron
- Prestige Engineering

NAMES TO REMEMBER:
- Matt Martin
durability. It is made of cedar strips overlaid with epoxy and fiberglass and painted to look like the traditional birch bark.

LEARNING HISTORY AND MORE
In merging historic traditions with modern technology, the Detroit to Pittsburgh Canoe Trip represents a remarkable application of Lawrence Tech's motto "Theory and Practice."

During the trip, team members will explore several subjects that directly relate to what they are experiencing, including hydrology, environmental science, history, and entrepreneurship. They will study the five watersheds through which they will pass, the technology and culture of the 1750s, and the impact of technology on the landscape. The route takes them through three of the nation’s largest cities—Detroit, Cleveland, and Pittsburgh—as well as some of its more pristine areas. Participants have earned up to six college credits.

Beyond lectures and research in the above subjects, team members are gaining real-world experience in teamwork, communication, leadership, organization, logistical planning, and physical fitness and endurance.

The communities that the team passes through also will benefit as the trip draws attention to their historical heritage and the natural beauty of a region marred by industrial activity, where both heritage and beauty are too easily (and too often) overlooked.

TRIP DETAILS
• Team member Chais Naida used mapping software to plot more than 1,500 points and arrive at the total trip miles of 483.5.
• All the canoeists passed a basic swimming skills test, and four became Red Cross certified lifeguards.
• The Compagnie LeBoeuf, a group of French and Indian War reenactors, will canoe with the team from Waterford to Pittsburgh.
• Some students will dress in authentic period clothing.
• Team members will make presentations at stops along the route.
• The Detroit to Pittsburgh Canoe Trip has been integrated into the state of Pennsylvania’s official French and Indian War Commemoration calendar of events.

For further information visit www.ltu.edu/canoe_trip or contact the Lawrence Tech News Bureau, 248.204.2210.

The Lawrence Tech Advantage
• Fast wireless hop campus in Michigan
• Personal learning environment
• Faculty with current industry experience
• Convenient day, evening, weekend, and online classes
• Numerous financial aid, co-op, and internship opportunities
• On-campus housing

Lawrence Tech offers over 100 undergraduate, masters, and doctoral programs in Colleges of Architecture and Design, Arts and Sciences, Engineering, and Management.