

Collaborative Engineering Education: An International Teaming Approach

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Abstract

This paper will describe an international exchange program that is presently taking place between Central Michigan University (CMU) and Vladimir State University (VSU). CMU is located in the mid-west and VSU is located in the cultural heartland, the Golden Ring of Russia. It is approximately 200 kilometers (125 miles) east-northeast of Moscow. This exchange program involves a group of technical students led by faculty from each university traveling to the other's country for a period of two or three weeks.

The purpose of the student and faculty exchange is to provide an opportunity for each group to experience the technical, cultural, and social aspects of each other's country. CMU has taken on the responsibility of developing and coordinating technical projects shared by both universities. The projects usually focus on an aspect of automotive and/or electronic technology and require the participation of students and faculty from both countries. Project design and implementation usually involve research, systems engineering, and a practical application within industry.

I. INTRODUCTION

A. History and Description of the Exchange

The genesis of this exchange has its roots in a Sister Cities program which was initiated in 1989, with Vladimir, Russia, a city of about 400,000 people. Vladimir is also the home of Vladimir State University (VSU), the premier engineering university in that region of Russia. While the Russian representatives were touring their American sister city, they stopped at the university in that city and visited the Industrial Technology Department. During that visit two individuals, one American and the other Russian, spent some time in discussion and discovered that they were both university professors specializing in technology and both were interested in the possibility of an educational exchange for their students and faculty.

Discussions progressed and resulted in a signed agreement between the two universities, committing both institutions to a three-week exchange of students and faculty. The Americans were scheduled to travel during the month of May, and the Russians in October. The stated purpose of this exchange was to observe foreign industrial technology, to provide cross-cultural experiences, and give the students and faculty an opportunity to collaborate on technical projects.

The first two objectives were easily accomplished, the third is well underway, accompanied by continual challenges and refinements.

One measurement of the exchange program's success is the most recent agreement, which was signed in October 1997. The new agreement, a change from the first, is an open-ended document, allowing greater flexibility and is based on mutual expectations and trust, attributes which had to be earned. The early exchanges had many challenges and adjustments, however, after several years the exchange program is running quite smoothly and continues to evolve.

Despite the ever-changing politics and economic structures in Russia, the exchange is alive and well. It is becoming an expected annual event within the school calendar of both universities.

B. Importance of the Exchange

Few aspects of life today remain untouched by the global community. Many of the goods and services, which are an integral part of the fabric of our lives, are influenced by international relationships. American universities have recognized this fact and are responding by using several different models of international education. Some require a foreign language component in their programs, others have chosen to add an international experience, and still others, a combination of the two. Faculty in the Industrial and Engineering Technology (IET) department at Central Michigan University (CMU) have been involved in both. As a result of these experiences they have selected the three-week international experience model as that which best fits the needs of their students. This exchange has become a useful course option in the IET department at CMU.

Exchange participants who have graduated and are now working in industry continue to provide positive feedback concerning the lasting influence of this exchange program. They cite increased industrial and social awareness as the most meaningful benefits, not to mention lasting international friendships and industrial network contacts.

II. HOW THE EXCHANGE WORKS

A. The Agreement

The Rector (President) and a Dean from VSU were invited to CMU to sign the first agreement. The first agreements were yearly documents which were quite rigidly constructed, very clearly delineating the responsibilities of each institution. Over time, confidence in each other has increased and mutual understanding has developed. Although the latest agreement lists the major responsibilities of each institution, many aspects such as dates, numbers, and qualifications of participants are easily handled by timely e-mail communication.

Generally, the agreement assigns the responsibilities of local travel, room and board, and related expenses of the visiting group of students and faculty to the host institution. Of course, individual personal expenses are the responsibility of each traveler. Refer to Tables I and II for a listing of the major responsibilities assigned to each institution.

Table I
Responsibilities of Central Michigan University

- All air transportation
- All ground transportation while at CMU
- Homestay accommodations for all Russian visitors
- All regular meals while at CMU
- Translators for official functions in Michigan
- Health insurance for all Russian visitors
- Classroom and office space at CMU as needed
- Field trips to Michigan industries
- Cultural/sightseeing visits to local points of interest in Michigan

Table II
Responsibilities of Vladimir State University

- All official ground transportation in Russia
- Homestay accommodations for CMU students
- Apartment for CMU faculty
- All regular meals in Russia
- Translators for official functions in Vladimir
- Basic health care for routine illness or injury
- Classroom and office space at VSU as needed
- Field trips to industries in the Vladimir area
- Cultural/sightseeing visits to local points of interest in the Vladimir area

B. Logistics of the Exchange

The yearly exchange cycle begins at CMU in November with the selection of the faculty leaders. Realizing that this will be a yearlong commitment, the selection is usually based on faculty availability and an expression of interest. Program promotion comes next, culminating in the selection of the participating students.

Normally, early in November, several advertisements are run in the campus newspaper, flyers are posted in campus buildings, and classroom announcements are made promoting the first meeting for organizing the exchange. The first meeting with interested students is used to provide them with detailed information regarding the dates, travel requirements, costs, and post trip obligations. Several previous participants are usually in attendance at this first meeting to provide additional information and give a student's perspective of trip dynamics and benefits. Those who are interested are given an informational packet which includes an exchange application. Later, during the first week of the second semester, early in January, the final recruiting effort is conducted.

The student selection process is based upon class standing, letters of recommendation, and a short essay addressing such things as career goals, international experience, expected benefits, and how these benefits will be applied within the student's academic program. The exchange group usually

contains eight to ten students and one or two faculty members. Departmental IET students have first priority followed by students from other departments if there are unfilled seats.

After the participating group of students has been identified, usually by the third week in January, a series of monthly meetings is scheduled at faculty homes. In most cases the participating students do not know each other and are somewhat uncomfortable and intimidated by the prospect of spending three weeks in a foreign country with complete strangers. The monthly meetings, in a home setting, are designed to allay these concerns, build a group identity, and help participants begin to relate to each other on a personal basis. When the exchange group leaves America and lands on Russian soil it must be a cohesive unit, not a group of strangers. Post exchange discussions have identified these early meetings as being an important pivotal point for the students. Most have not participated in international travel before, indeed, some have never even been on an airplane prior to this trip. There are bound to be a few anxious moments during the exchange, therefore, having an exchange “family” to provide support during those times is meaningful. Faculty leaders must be sensitive to these important dynamics.

The monthly meetings are also used to go over checklists, provide handouts, practice the Russian language, and discuss cultural peculiarities which most Americans would not be aware of. Having a basic familiarity of even a few Russian words and common phrases helps to give the students confidence for upcoming social contacts, provides key words for emergency situations, and perhaps as importantly, it communicates to the Russian hosts that the Americans care enough to try to meet them halfway. Several Russian students who are studying at CMU are usually invited to at least one of these pre-trip meetings. Their assistance helps the group to improve their cultural sensitivity and language pronunciations.

C. Academic Requirements

The exchange requires the students to enroll in a departmental course entitled, “International Engineering Technology”, for three to six units of academic credit. This course utilizes a textbook on international technology (4). The course requires the students to attend all of the pre-trip meetings where, in addition to the previously mentioned topics, industrial case studies of several international companies are reviewed. These studies serve as comparative benchmarks during their trip and provide the students with a perspective through which they can more accurately observe and evaluate the Russian technology they will visit during the exchange.

The course also requires the students to maintain a detailed daily journal. They are asked to begin their journal with some pre-trip thoughts and expectations. While in Russia, they are encouraged to include detailed descriptions of daily interactions, activities, and in particular, observations which relate directly to their academic field of study. The journal should conclude with a comparison of the pre-trip thoughts and expectations with what they actually found and experienced. The journal is due approximately two weeks after returning to America and provides an important basis for the final grade they will receive. The journal also provides a basis for presentations they may be asked to give to local community or university groups.

D. The Technology Project

Central Michigan University has taken the lead in developing technical projects that both universities can share cooperatively. The projects usually involve an aspect of automotive and/or electronic technology and require the participation of both groups of students and faculty. The project includes research, systems engineering, and a practical application. As both groups work on this project, information technology, design, manufacturing, and service issues arise allowing both students and faculty to share ideas and perspectives. They also gain experience at communicating technical concepts across cultures.

The technical focus of the exchange project(s) is largely determined by the technical composition of the participating student group. If the group is primarily composed of a particular technical specialty, that fact will generally determine the technical focus of the project. If the group is sufficiently large and technically diverse, two concurrent projects may be selected.

The exchange project tries to tie into the academic strengths of the individual universities. The academic strength of VSU lies in their deep theoretical education. This is primarily due to the minimal amount of funding available for expensive, modern laboratory equipment. Since VSU has such deep roots in theoretical education, the practical application portion of the project is of particular interest to the Russians. The strength of CMU is in the availability of advanced laboratory equipment and the practical application of technical education to realistic problems in industry

An important aspect of these projects, other than the obvious technical cooperation, is that of international communications. Telephone and postal communications are expensive, slow and very unreliable. The requirement of successful project completion quickly emphasizes to the students the importance, indeed the necessity, of frequent, efficient, rapid and reliable communication. The students soon discover the speed, efficiency, and convenience of electronic communications through E-mail and FAX. These communications are conducted in English.

Technical projects are discussed and proposed during the fall visit of the Russian delegation to the CMU campus. The faculty of both institutions attempt to identify projects which will allow the students to develop practical solutions to technical challenges in Russia. When the CMU group travels to Russia, the project hardware and software is carried in their luggage. There have been no problems with customs so far! Upon arrival, the students and faculty work together, as much as possible, to complete the practical application. In most cases, however, the Russians complete this portion of the project after the Americans have left. As the project moves toward completion, it usually requires continued international communication until it is finalized, months perhaps, after the American group has gone home.

This year, as an example, due to the size and technical diversity of the CMU group, two projects were planned, one for the electronic students with a manufacturing application and another for the automotive students. The electronic students are developing a programmable logic controller, which will be adapted to a Russian robot and configured for a manufacturing application. The automotive students are developing an electronic engine management system which their Russian counterparts will adapt to a Lada (Russian) automobile, one of the most popular models in the

Vladimir region of Russia. Lada automobiles, in fact, most common Russian automobiles, are decades behind western automotive technology.

As the exchange relationship matures, CMU anticipates the technical projects will continue to evolve and add relevance to our relationship for both students and faculty. Although our language, history, and culture are very different, during the technology phase the student groups will focus less on these differences than they will on the common technical challenges at hand.

E. The Russian Visit

As soon as summer schedules permit, the IET department at CMU begins planning for the Russian visit in October. This entails issuing an official invitation to the students and faculty representing VSU, making air travel reservations, and finding suitable homestay accommodations. Concurrently, a schedule of activities is generated which will show the Russians who we are, how we live, how the university works and how various industries operate. The Russian perception of the American way of life is somewhat limited and distorted. It has likely been shaped by what they have seen and heard through television and Hollywood productions. In almost every instance, they are as surprised about who we really are and how we really live as the American group is of them.

The Russian visit culminates with a farewell dinner accompanied by many toasts for happy memories, success for the students, and new opportunities for the future. Refer to Table III for a detailed description of the typical VSU schedule in America.

**Table III
VSU Schedule in America**

| | | |
|--------|---|---|
| 27 Oct | 7:00 pm | Depart to pick up Russians at airport |
| 28 Oct | 1:00 pm | Canoe trip and picnic |
| 29 Oct | 8:00 am 9:15 11:00 6:30 pm | Departmental tour Campus tour Local community tour Walleyball game at Student Activity Center |
| 30 Oct | 9:30 am 12:00 1:30 pm 3:00 5:30 | CME industrial tour Lunch with President of the university Delfield industrial tour Ford automobile dealership tour Dinner with students in Saxe-Herrig dormitory |
| 1 Oct | 8:00 am 1:00 pm 5:00 7:30 | Depart for Detroit metropolitan center Roush Engineering tour Visit the Renaissance Center in downtown Detroit Ethnic dinner in Greektown |

| | | |
|--------|---|---|
| 2 Oct | 9:30 am 1:00 pm 6:00 | Henry Ford museum tour Depart for shopping mall German dinner in Bavarian Inn, Frankenmuth |
| 3 Oct | 8:30 am 12:00 2:00 pm 6:30 | Student project time Dinner with Provost and Council of Deans Target shooting Dinner at faculty home |
| 4 Oct | 9:00 am | Depart for all day fishing trip on Lake Michigan |
| 5 Oct | 3:00 pm 6:30 | Bowling Dinner at faculty home |
| 6 Oct | 8:30 am 6:30 pm | Student project time Walleyball game at Student Activity Center |
| 7 Oct | 8:00 am 9:30 11:30 1:00 pm 3:30 | Depart for Industrial tours Oldsmobile body plant tour Lunch in Clara's restored train depot restaurant Oldsmobile assembly plant tour State capitol tour |
| 8 Oct | 9:00 am 1:00 pm 3:30 7:00 | Morebark industrial tour Visit Jay's sporting goods super-store Visit dairy farm Dinner at faculty home |
| 9 Oct | 8:30 am 6:30 pm | Student project time Dinner at department chairman's home |
| 10 Oct | 8:30 am | Student project time |
| 11 Oct | 10:30 am | Homecoming football game |
| 12 Oct | 1:00 pm 6:00 | Northwood automobile show Farewell dinner |
| 13 Oct | 8:30 am | Depart for airport |

III. SUMMARY

At first glance, a foreign exchange program may seem ideally educational, exciting, and exotic. It is, and more! Many people have traveled and interacted with foreign cultures with few problems, but in most cases these experiences are in countries which are generally considered "western" in nature. Dealing with an "eastern bloc", or formerly communist country, requires a new paradigm

(1) (2) (3). Nothing is ever as simple as it first seems (5). Seemingly simple logistic situations and problems in Russia sometimes require hours of discussion and negotiation to resolve. This can be very frustrating for Americans who are constantly consulting calendars and watches to be sure things stay on schedule. Even making what to us are simple everyday decisions can be very difficult for people who historically have had few decisions to make. One of the most predictable aspects of the Russian exchange program, especially while in Russia, is its day-to-day unpredictability. Planned excursions are postponed, bus transportation fails to show up, dinner plans are interrupted, and lengthy trips are made at a moment's notice with little time to prepare. Each day is a new adventure!

Listed below are some of the important aspects of a successful exchange program of this type.

A. Support

Adequate support is an obvious requirement. This support can take many different forms. As always, verbal support is much easier to garner than financial support. Support must start at the departmental level and move vertically through the chain of command. The upper level administration at CMU has for some time been calling for greater efforts toward internationalizing the campus. The Russian exchange program not only nicely fits their idea of internationalization, but is also being held up as a positive example to others on campus as one method of providing our students with a relevant international experience.

This exchange program is designed, and in fact operates, as an entirely self-supporting activity. Continuing efforts are always ongoing to identify outside sources of support. Although the International Relations Committee (IRC) of the local community has been supportive both with their organizational efforts and financial generosity, other efforts towards identifying sources of financial aid have been less successful.

CMU has an Office of International Education (OIE), which is dedicated to facilitating international activities and programs. This office handles the day-to-day budget affairs and some of the promotional activities.

B. Dedication and Time

An exchange such as this must be directed by dedicated faculty leaders who are committed to the program. The time commitment required for a successful exchange program is quite large. There are a myriad of details which must be monitored and expedited in a timely manner to ensure program success. Refer to Table IV for a detailed chronology of major events and responsibilities.

Table IV
Chronology of Events and Responsibilities

| | |
|--------|--|
| 27 Oct | Begin exchange promotion |
| 3 Nov | Budget planning meeting with OIE |
| 6 Nov | First organizing meeting with students |
| 15 Nov | Initiate air and hotel reservations |

| | |
|---------|---|
| 5 Jan | Promote second organizing meeting |
| 15 Jan | Second organizing meeting |
| 23 Jan | Exchange applications due |
| 24 Jan | Participating students selected |
| 26 Jan | Passport applications completed |
| 28 Jan | Prepare handouts for first meeting |
| 30 Jan | January exchange meeting at Chairman's home |
| 2 Feb | Request official invitation from VSU |
| | Finalize air and hotel reservations |
| 27 Feb | February meeting at home of faculty leader |
| 10 Mar | Receive passports for visa applications |
| 15 Mar | Send out visa applications to Russian consulate |
| 20 Mar | Invite on campus Russian students to March meeting |
| 27 Mar | March meeting at faculty leader home |
| 3 Apr | Receive visas |
| 6 Apr | Silk screen exchange tee shirts |
| 8 Apr | Request financial assistance renewal from IRC |
| 24 Apr | April/final meeting at faculty leader home |
| 4 May | Confirm and finalize exchange arrangements |
| 10 May | Meet at department for trip to airport |
| 12 May | Arrive in Vladimir, Russia |
| 19 May | Meet for dinner to evaluate ongoing exchange activities |
| 26 May | Depart for London |
| 29 May | Depart for home |
| 15 Jun | Journals due |
| 26 Jun | Grades due at registrar's office |
| 10 Aug | Request list of Russian visitors |
| 12 Aug | Send invitation to Russia |
| | Make air reservations |
| 4 Sep | Make homestay arrangements |
| Ongoing | Arrange activities for Russian visitors |
| 17 Aug | Send tickets to Russia |
| Ongoing | Confirm activity calendar |
| 3 Oct | Pick up Russians at airport |
| Ongoing | Host Russians (Table III) |
| 18 Oct | Farewell dinner |
| 19 Oct | Bring Russians to airport |
| 20 Oct | Write thank you letters to all who helped with exchange |
| 22 Oct | Rectify budget with OIE |

One person should be charged with the overall responsibilities of the exchange, or, if more than one, the duties must be clearly delineated to be sure nothing is overlooked. The ideal scenario would have release time given to the person who has been designated as the lead faculty member.

It is important that the exchange activities proceed smoothly and details fall into place as planned. This inspires student confidence and makes the exchange a more positive experience. Again, never underestimate the amount of student anxiety. The exchange may be rather routine for faculty who may have made the trip before, but this is a first-time experience for the students. They are still dealing with their stereotypical perceptions of who the Russians are and how they act toward Americans, our best efforts to dispel these images, notwithstanding.

C. Communication

Another critical component of the exchange program is the importance of efficient and precise communication among all parties involved. It is very easy to misinterpret what another party has said, particularly given the differences of language and culture. The Russian language presents a number of interesting challenges for both students and faculty. It is completely different from Latin based languages such as English. The Cyrillic alphabet is very complex and difficult to read, speak, and learn. However, since most educated Russians have been exposed to English in their schools, many speak at least rudimentary English. They are quick to point out, however, that English and American English are two entirely different things. Interpersonal communications have not been an insurmountable problem for the students thus far.

The Russian culture itself is very interesting. There are many customs and modes of behavior that a foreign visitor must be aware of to deal successfully with the Russians. Knowing the cultural factors of a foreign country is critically important to the success of any visit, however, in Russia they seem more pronounced. The Russian students enrolled at CMU who have attended the monthly pre-trip meetings were very helpful and instrumental in alerting us to these cultural differences. As previously mentioned, E-mail, which is always in English, is the preferred method of distance communication.

D. Benefits for Students

During the initial discussions between the two universities a decision was required regarding the length of the exchange visit. Traditionally, many exchange programs are constructed around a time period of one semester. This fits comfortably into most academic calendars and allows for a deep immersion into the day-to-day life of the host country. In an effort to make this exchange experience available to as many students as possible, the exchange program described in this paper purposely deviated from the semester model for several reasons. First, the cost is an important consideration for most students. Second, a trip scheduled for three weeks in May does not prohibitively intrude into summer employment. Third, the culture shock is intense, but is minimized by the shorter residence interval in the host country. This is equally true for both the American and Russian students.

With increased internationalization taking place in the world today, universities are strongly encouraging departments to include an international component in their academic curriculum. This exchange program serves as an important vehicle to show the students at CMU and VSU this global aspect and the importance of international familiarity.

Feedback from the students, both verbally and from their journals, indicates that their participation in this Russian exchange program, although financially challenging, has been a pivotal point in their education, indeed, their lives. It has greatly expanded their appreciation of what Americans have and has dispelled their stereotypical impression of who the Russian people are. After graduation many of these students will likely work for companies with international divisions. We hope this exchange experience will enable them to enjoy a smooth transition from academia to the global village awaiting them.

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