Summer Technology and Engineering Preview at Stout for Girls (STEPS for Girls): Introducing the World of Manufacturing

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Abstract: The University of Wisconsin-Stout hosted a tuition-free summer engineering and technology camp for 163 girls entering 7th grade in four one-week sessions in July 1997. The purpose of the camp was to expose women to the opportunities for technical careers early enough to influence their choices of math, science, and technical courses in middle and high school. The camp was partially supported by grants from four industries and organizations, including the Society of Manufacturing Engineers, Honeywell, the Ford Motor Company Fund, and the Stout Foundation.

Hands-on technical activities focused on manufacturing and included the following: manufacture of radio-controlled model airplanes in a production system followed by powered flight by each girl of her own airplane, plastic processing in which each girl thermoformed her own sailboat, CADD, foundry, automation, robotics, packaging, and orientations on math, physics, and chemistry. Each camp published and printed a newsletter containing articles written and photographs taken by the campers.

The 40 campers in each week were organized into four 10-girl teams, each led by a woman University student counselor. Three of the counselors were manufacturing engineering undergraduate majors. The campers stayed in a dormitory for the week and ate most meals in the Student center cafeteria.

The camp received excellent regional press coverage by three TV stations, two local newspapers, AP distribution, and seven packaging journals. Initial feedback indicated an impressively positive change in attitude toward engineering and technical careers. The University plans to track the progress of the girls through college enrollment.

Introduction. The University of Wisconsin-Stout hosted the Summer Technology and Engineering Preview for Girls, a tuition-free summer engineering and technology camp, for 163 girls entering 7th grade in four one-week sessions for the first time in July 1997. The purpose of the camp was to expose women to the opportunities for technical careers early enough to influence their choices of math, science, and technical courses in middle and high school. Forty girls were invited to attend each of the one-week sessions during the following Sunday through Friday sessions:

Week 1: July 6-11
Week 2: July 13-18
Week 3: July 20-25
Week 4: July 27-August 1

Background: A Manufacturing Engineering program at UW-Stout began officially in the fall of 1994. In recruiting engineering faculty to support the program, great difficulty was experienced in locating and attracting woman and minority candidates. It was felt that the most effective means of changing this situation was in the long term, by exposing youngsters in these groups to the opportunities for careers in engineering before they make irreversible curriculum decisions in middle school and high school.

The low rate of participation of women and minorities in engineering careers is well documented. Roughly 25% of freshman engineering students are women, and the total number of female freshmen is declining. According to a recent study by the National Action Council for Minorities in Education, minorities made up only 15.9% of freshman engineering students in 1995, the lowest level since 1991. As a result, society is denied the services of talented people who, were it not for gender or cultural biasing, have the potential to become excellent engineers. Without intervention of the nature represented by the STEPS for Girls concept, most young students make critical high school curriculum choices that limit their ability to follow, enter, and succeed in an engineering program in college. Therefore it is essential to reach them early with solid information about the excitement of an engineering career and what it takes to follow one. This program was designed to do that.

As a result, the concept of a summer engineering and technology camp for girls entering the seventh grade was developed. An initial goal was that 50% of the campers would represent minority populations. Only 30% minority was actually realized, a fact which will be discussed later.

Concept. The activities of the camp were developed to achieve an appropriate balance between technical and recreational activities, and to conform as closely as possible to UW-Stout's "hands-on, minds-on" philosophy in a small group setting. Selected activities focused around manufacturing concepts, involving both processes and production systems. No more than two consecutive hours were scheduled for any technical activity to avoid surpassing the attention

span of the youthful audience. Instructors were tasked to develop activities that were not only instructive and interesting but also fun. As many woman role models as possible were presented to the campers in both technical and administrative contexts.

The campers were given an experience as close to college life as could be provided. They lived together in a dormitory for their week of camp attendance, ate meals in the Student Center cafeteria, attended classes in college classrooms and labs, and were taught by real college professors. They were organized into four teams of ten, each team identified by a distinctively colored T-shirt (purple, blue, yellow, and green). A UW-Stout woman student was assigned as the dedicated counselor to each team. Three of the team counselors were woman students enrolled in the manufacturing engineering Program.

Application and Enrollment. The University of Wisconsin-Stout Office of Continuing Education spearheaded the application and enrollment effort. Brochures complete with application forms were designed and printed. 6000 of them were distributed to every school district in the state of Wisconsin and the Minneapolis/St. Paul metropolitan area in early March 1997. In addition, special interest groups, such as Girl Scouts, girls' clubs, community centers, home/school coordinators, tribal newsletters and liaisons, and private schools, were sent mailings and received phone calls. Applicants were eligible if they had just completed the 6th grade and were recommended by a teacher or counselor.

The 80 openings for non-minority girls were filled within two weeks on a first come-first served basis, and a waiting list of alternates was established. Minority students were then specially targeted until the middle of May when the camp was filled from the waiting list. As the campers were accepted, they were sent a registration packet including personal data, medical history, and parental consent forms. Final enrollment included 50 minority students as follows:

Caucasian	113
Asian	19
Native American	17
Hispanic	10
African-American	4
TOTAL	163

Extraordinary measures were employed to attract and accommodate minority campers. Faculty contacts were developed in the heavily minority-populated schools in Minneapolis/St. Paul, Milwaukee, and the Indian reservations. A van was sent to the Red Cliff Indian Reservation to pick up and return four campers in Week 1 and five in Week 4. The Head Camp Counselor made a special trip to the reservation in May to coordinate with campers and their parents. Transportation was arranged and funded for three Hmong campers from Milwaukee.

The necessity of this special effort was evident as a result of attempts to coordinate the attendance of interested minority campers and from the fact that 14 of the 17 no-shows were minorities. In many cases, particularly where daughters of first-generation immigrants are concerned, there appears to be a lack of assistance, encouragement, or understanding on the part

of parents concerning developmental opportunities such as the STEPS for Girls program. The brightness and enthusiasm of the girls, who are fully assimilated into school activities, catches the attention of their teachers who excite them about such opportunities and assist them in applying. Acceptance of the girls into the program is then followed by a confusing packet of registration forms sent to parents with whom the teacher has not coordinated and who may not have the ability to provide transportation to a campus many miles away. This innocent lack of support from home prevented many of these girls from showing up. In future years, this problem will be alleviated by sending parents registration correspondence and forms in their native language and by enlisting the assistance of sponsoring teachers in the registration process.

5. **Activities.** From arrival of the campers on Sunday afternoon until departure on Friday afternoon, there were 66 hours of scheduled time other than routine meals. The balance among the various types of activities is shown by the following:

Technical Activities	21.5 hours
Developmental Activities	17.5 hours
Recreational Activities	17.0 hours

Since most instruction was presented to a single ten-girl team at a time, each team had a different schedule. Each instructor taught the same class four times each week, usually over a one or two day span. Using the sequence for one of the teams as a guide, a chronological description of the activities follows:

SUNDAY:

2:00-4:00 Registration

As they arrived, campers were issued a room key, two T-shirts and a pair of safety glasses of the appropriate team color, a notebook, and pencils. They wrote their first name in large letters with a magic marker on the right sleeve of each T-shirt which had the STEPS logo on the front and the logos of the sponsoring agencies on the back. The nurse who was assigned to cover the camp checked medical forms and collected prescription medications which she later administered when needed.

The campers were then directed to the fourth floor of the dorm where their team counselor assisted them in getting settled in their rooms and introduced them to their teammates. Campers were housed two to a room and were pre-assigned roommates. All requests for specific roommates were honored. During this period the girls each filled out a questionnaire designed to determine what their career aspirations and knowledge of engineering and technology as a possible career. The same questionnaire was given at the end of the week to get a short- term idea of their changes in attitude and knowledge.

4:00-5:00 Orientation

The campers gathered in an auditorium for a multimedia orientation by the camp director. They were informed of the purpose of the camp and what an engineer was and did. An excellent 13-minute video developed by the Society of Manufacturing Engineers, entitled, "Engineering: Making It Work" was shown. Parallels between the manufacturing systems and processes depicted in the video and those that the girls would experience in the coming week were drawn. They were presented statistics that showed that girls were just as proficient as boys in the areas important to becoming a good engineer. Camp activities were summarized.

An important feature of the orientation was the assignment to each team of specific activities for which they were responsible to write articles for the camp newsletter to be printed at the end of the week. Each team was issued a 35-mm camera and film to photograph the activities.

5:00-6:00 Picnic

The Student Center catered an outdoor barbeque picnic in the green area adjacent to the facility.

6:00-8:00 Scavenger Hunt

A scavenger hunt was used as a vehicle by which the girls would become acquainted and to familiarize them with the dorm and the surrounding area. Prizes, such as UW-Stout decals, were awarded at each success.

8:00-10:00 Snacks, Discussion, Quiet Time

This period was used to reflect upon the day's activities, to prepare for the next day, to write newsletter articles, to socialize, and to wind down before bedtime. A different snack, such as kool aid and granola bars, was provided each night. Teams met together as a group. Supervised by the team counselors, they would report on what they liked and didn't like about the day. They were asked to recall where math and science were used in each activity. The period was useful in resolving many of the inevitable personal conflicts that arose.

10:00 Lights Out

Girls were required to be in their rooms at this time. Each of the team counselors as well as the alternate counselor had single rooms at strategic locations on the floor. The two exit doors from the floor were locked to prevent intruders but to allow egress in an emergency. A woman student was hired to remain awake overnight in the common area of the dorm and to make periodic rounds in order to maintain discipline and security. These measures along with the vigilance of the dorm supervisors at the main desk were responsible for the fact that there was never an incident during the entire month in which the safety or security of any camper was ever an issue.

MONDAY

7:00-8:00 Breakfast

Most meals were eaten in "The Pawn", a cafeteria in the Student Center. It featured a wide variety of fruits, sandwiches, pizza, grill orders, pastries, chips, and snacks. Each team counselor was issued a "debit card" which electronically tabulated the meal charges for the team through the week.

8:00-9:00 Mathematics

The instructor began the class by providing information to the campers concerning where on the internet they could find fun and instructive math puzzles and problems. The remainder of the presentation involved topology, particularly that of a Moebius strip. The campers were given a strip of calculator paper that they taped together to form a loop with a half-twist, forming a Moebius strip. The girls proved that the strip was a one-sided object by tracing a line down its center. They then investigated the strange properties of Moebius strips by constructing several with one, two, three, and four half-twists, cutting them in half along the center line and in thirds and fourths parallel to the center line, and making observations concerning the results. A matrix was established to tabulate the results from which the girls were asked to determine a pattern from which they could predict the results of more complicated cuts on strips of more than four half-twists.

9:00-10:00 Walk

The Team Counselor took her campers on a tour of the campus.

10:00-12:00 Computer-Aided Design and Drafting

The campers were introduced to the computer equipment and software (AutoCAD, ProENGINEER) that engineers work with to make graphical representations of objects. They were shown engineering drawings, 3-D models, and computer-generated animations. Then a ProENGINEER 3-D model of the radio-controlled airplane that the girls were to manufacture in a different activity was projected to the screen of each girl's Silicon Graphics (SGI) workstation. The girls made changes to the model by rotating it and changing its size, color, and surface

pattern. They disassembled and reassembled it and introduced text to the image. They then were allowed to develop 3-D models of their choosing, using SGI software, which they could manipulate as they did the airplane model. Using the SGI equipment in the lab, they recorded sounds and video images which they were shown how to modify and integrate into their work.

12:00-1:00 Lunch at the Pawn

1:00-2:00 Physics

Class began on the sidewalk outside the building that houses the physics labs. The instructor addressed the team from the building roof from which he dropped several pairs of balls, including a bowling ball, to demonstrate the gravitational constant and the effect of air resistance on the acceleration of a light ball of large surface area. In the lab he continued with demonstrations of circular motion, the motion of air molecules and air pressure. The team then participated in a lab activity to study projectile motion. Using spring-loaded firing devices, they charted the range achieved by marbles fired at a variety of initial angles of elevation. Using this information, they predicted the elevation angle required to reach a given spot and competed to see who could fire the most marbles into a can.

2:00-3:00 Library Orientation

Campers were given a tour of the library. Following the tour, they visited the reference section where they conducted computer searches for articles on subjects in which they had an interest. They looked up issues of magazines and newspapers to find out what was on the news on their birth date. They operated the microfiche to read the articles and made copies of those of significance.

3:00-5:00 Airplane 1

A production system to manufacture radio-controlled model airplanes was the focus of this activity. The airplane and the production system had been designed by the instructor with the assistance of students in his design course the previous semester. He initially gave the team instruction on the theory of flight, Bernoulli's Principle as it applies to the airfoil of a heavier than air aircraft, the four forces acting on an aircraft (thrust, drag, lift, weight), and the means of controlling pitch, yaw, and roll. They were shown a prototype of the aircraft they were to build and the removable motor/controller module that was designed to fit into it and control its flight on Wednesday night.

The girls were then organized into work teams to manufacture ten sets of tail assemblies, wings, and fuselages. Three campers manufactured wings from two styrofoam blocks of rectangular cross-section. Two girls operated a hot wire cutter in a jig designed to form the blocks into the correct airfoil shape. The third girl fastened two of the wing sections together end to end using epoxy, tape, and a fixture to establish the right dihedral angle of the full wing.

Three girls were in charge of manufacturing tail assemblies. One cut control surfaces from thin aluminum and bent and punched holes in them according to instructions. The other two used a jig to cut horizontal and vertical stabilizers from 1/8 inch foam core. They then assembled the stabilizers together in a special fixture that held the surfaces exactly perpendicular. They used a hot glue gun to fasten them and taped the metal control surfaces to the stabilizers. The tape acted as a hinge to allow rotation of the control surfaces.

Four girls manufactured the fuselages from sheets of 1/8 inch foam core. Two cut the basic shape using a jig and drilled a series of holes using a second jig. With another jig as a guide, the third girl routed fold lines in the work piece. The fourth folded the piece around a series of two mandrels that established the shape of the fuselage and hot glued and taped the seams together.

A star sticker of the team's color was placed on each component as it was completed, and the components were stored on tables awaiting final assembly, which was to occur on the following day after giving the glue time to set overnight. The team then toured the lab together, and each work group explained to the others the processes and procedures they used to manufacture their component.

Since this was the last group to manufacture their airplane components, the lab contained a full inventory of 40 wings, 40 tail assemblies, and 40 fuselages.

5:00-6:00 Dinner at the Pawn

6:00-7:00 Recreation Center Activities

The Recreation Area in the Student Center was reserved for exclusive use by the campers during this period. All forty campers gathered together for this activity. Facilities included eight bowling lanes, several ping pong tables, a room full of pool tables, an air hockey table, and an array of video games.

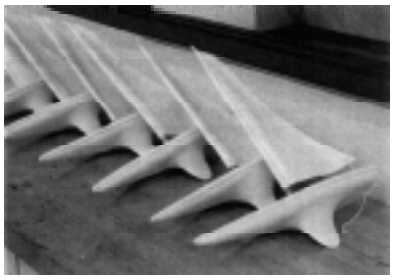
8:00-10:00 Snacks, Discussion, Quiet Time, Lights Out

TUESDAY

7:00-8:00 Breakfast at the Pawn

8:00-10:00 Plastics

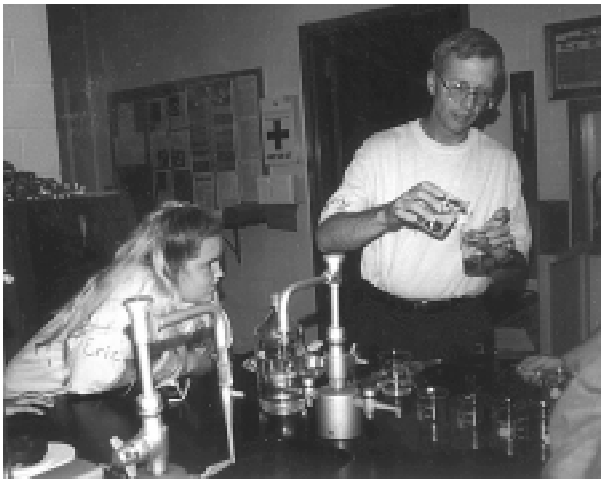
The lab began with a 15-minute orientation on the types of plastics used in manufacturing and the various processes used to form them. Campers first learned to operate an injection molder with which they were able to make a variety of key chain fobs with different mold designs: Snoopy, Fred Flintstone, or the UW-Stout logo.



The primary activity was manufacturing a sailboat that was a model of the yacht raced by a team of women in the 1995 America's Cup. The girls were provided a handout listing the crew of the yacht and their backgrounds. The hull and the deck were thermoformed on a dies pre-constructed by the instructor. The girls trimmed the excess material from the work pieces, sanded the rough edges, and drilled holes in the deck for the mast and rigging. Resin was poured into the keel cavity of the hull to provide proper balance of the boat. Once the resin had set, a hole was drilled into it to provide a support base for the mast. The hull and keel were assembled and sealed, the mast was inserted, and a single sail was rigged. The girls were instructed on how to adjust the rigging to allow the boat to sail in a variety of conditions. Each girl constructed her own sailboat that was hers to keep.

10:00-11:00 Chemistry

Instruction centered around chromatography. The class began with demonstrations of the separation of a mixture of colored dyes by column chromatography and by paper chromatography. Following these demonstrations, related terms were discussed including "solvent", "solute", "cohesion", "adhesion, and "capillary action". Campers made colored circular patterns by stretching cloth over a coffee can in the manner of a drum head, marking the stretched surface with various colored permanent ink markers, and placing drops of isopropanol in the center. The liquid moved radially by capillary action, creating an interesting chromatographic separation pattern as the dyes were carried along in the solvent flow. After several iterations, the resulting artwork was placed in a black paper frame which the artist/chemist/camper kept as a souvenir.



Use of a Hewlett Packard Model 5890 gas chromatograph was then demonstrated.. A mixture of three alcohols (methanol, ethanol, and isopropanol) was analyzed to determine its make up. Using the results of this calibration, the campers tested a commercially available mouthwash to determine which of the three alcohols it contained.

11:00-12:00 Airplane 2

The campers were shown how the detachable motor/control/landing gear module, four of which had been designed and fabricated by the instructor, was inserted into the nose of the model airplane and how the control surface controls were connected. They were instructed on the use of the joystick on the remote control to control the flight of the airplane.

Campers now selected a set of components to assemble their own individual airplane. The leading edge of the wing was notched with a hot wire cutter to fit into the fuselage. The upper surface of the wing was covered with a checkered pattern contact paper, and a strapping tape stiffener was attached from tip to tip of the under surface. The tail assembly and fuselage were assembled on a special fixture and hot glued together. The wing was attached using rubber bands that wrapped around wooden dowels which had been inserted into holes in the fuselage. Decals of a star, the STEPS logo, and the UW-Stout logo, all in the appropriate team color, were placed on the surface of the plane and the camper was free to decorate the surface as she pleased with pen or magic marker.

By the time this team had finished, a full inventory of 40 ready-to-fly model airplanes was stored in the lab.

12:00-1:00 Lunch at the Pawn

1:00-3:00 Swimming

The team joined a second team to swim in the indoor pool at the UW-Stout athletic facility.

3:00-5:00 Foundry

In this lab the campers were introduced to the process of hot metal casting. The process was described in a ten-minute class in which examples of cast products were discussed. The campers then went about the task of making their own aluminum casting in the shape of a mushroom. To construct the pattern, they first cut a 2-inch diameter styrofoam ball in half using a hot wire cutter to form a mushroom head. The head was hollowed out using a special fixture on a drill press. They cut a stem from ¾-inch styrofoam sheet and sanded the edges to form a cylindrical shape. They cut an irregular shaped styrofoam base. The three pieces were attached using a hot glue gun. Two of the mushrooms were then glued to a styrofoam riser system.

After packing the hollow area of the head with sand, the girls placed the pattern in a mold a covered it with dry sand. Meanwhile, aluminum was being melted in the electrical induction furnace. Wearing protective

equipment, each girl was allowed to observe the progress of the melt in the crucible and to assist the instructor as he sampled its temperature. Once the girls determined that the temperature had reached the required level, they watched from a safe distance as the instructor ladled molten aluminum into the mold. After the molds had cooled sufficiently, the mushrooms were removed from the mold and cooled in water.

The mushrooms were cut from the riser material, ground, polished, and given to each girl as a souvenir of her experience in the foundry.

5:00-6:00 Dinner at the Pawn

6:00-8:00 Activities in the Dorm

The counselors supervised arts and crafts activities. Materials were provided to make woven friendship bracelets and necklaces, beaded jewelry, and balloon balls filled with bird seed.

8:00-10:00 Snacks, Discussion, Quiet Time, Lights Out

WEDNESDAY

7:00-8:00 Breakfast at the Pawn

8:00-10:00 Packaging

At the beginning of the packaging session the instructor showed the campers real and prototype Coke cans, as well as other packages. They discussed the good and bad aspects of packages and the designs, functions of packaging and importance of eye-catching graphics. Next, The campers were given a tour of the packaging laboratory complex where they were able to operate some of the equipment, including a drop test, burst test and crush test using various types of packages.

Two hands-on activities were conducted in the lab. The first activity involved designing the shrink-wrapped package to hold a notepad and pencil. The campers developed their own artistic design for the supporting paperboard using colored magic markers. They then assembled the materials, covered them with a clear plastic film, and operated a hot air gun that shrank the film.

Next they worked on the CAD computer which designed the shape and set the dimensions of the container. They saw how the information from the CAD system linked to a sample making machine to automatically cut a container from corrugated material. Each camper operated the sample machine to cut and
score their own box. The instructor assisted them in stapling the side joint together and taping the bottom flaps. They then decorated all surfaces of the container as they desired using color magic markers. Each girl left the lab with a custom designed container in which she could store souvenirs obtained in other labs.

10:00-12:00 Robotics

Campers were given a short class on what an industrial robot is used for and how it is programmed. They then were taught how to control the motion of a Puma robot and record positions. They divided into teams to compete for speed and accuracy in programming the robot. The object was to pick the nine positions from which the robot would drop plastic donuts onto nine pegs arranged in a square matrix configuration. Each team was timed as it maneuvered the robot into the desired positions. Once all locations had been recorded, a canned program was run which caused the robot to pick donuts from a hopper and place them on the pegs. Penalties were assessed for each donut which missed its peg, and a winning team was determined by combining speed and accuracy results.

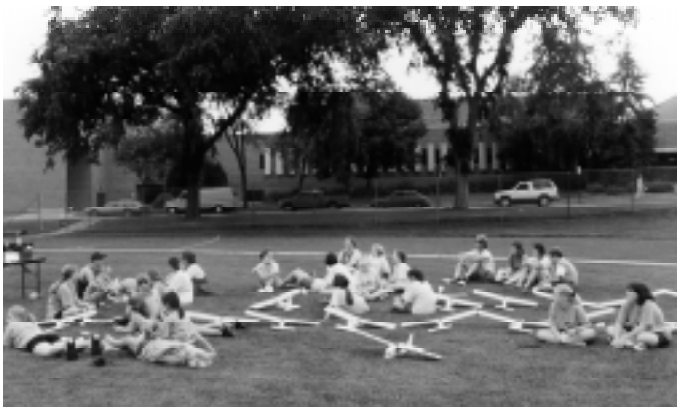
12:00-1:00 Lunch at the Pawn

1:00-5:00 Bike Trip

All forty campers, accompanied by the counselors and camp director took a bike ride on the Red Cedar Trail from Menomonie to Downsville, Wisconsin, and back. The round trip was about 15 miles in length. Several of the campers rode their own bikes, which they had brought with them to camp. The others were provided bikes that were rented by the camp from a local outfitter.

5:00-6:00 Dinner at the Pawn

6:00-9:00 Flight of Radio-Controlled Airplanes



The radio-controlled airplanes were flown at the UW-Stout athletic field. Four tables were set up with tools and equipment necessary to service the aircraft in preparation for flight by the instructor, his ground crew of grad assistants and tech ed teacher volunteers, and several members of the Menomonie, Wisconsin, RC Flying Club. Each team organized its airplanes in flight order. As her turn came up, each girl delivered her airplane to one of the tables where the ground crew secured the motor/controller/landing gear

module to the nose of the airplane, connected the control linkages to the control surfaces, adjusted the trim, fueled the airplane, and started it.

One of the ground crewmembers hand-launched the airplane which was then controlled in the air by an experienced pilot from the RC Club. Once he got the airplane to a reasonable altitude, he assisted the camper in operating the remote to control her aircraft. When she had the feel of it, he turned the stick over to her to solo. The airplane flew for about 4 minutes until it ran out of fuel, after which it glided back to the ground where it was retrieved by its owner who returned it to the table for removal of the module by the ground crew. The next flyer was then called to the table for preparation of her plane.

9:00-10:00 Snacks, Discussion, Quiet Time, Lights Out

THURSDAY

7:00-8:00 Breakfast at the Pawn

8:00-12:00 "Ropes" Course

All of the campers and counselors walked to Riverside Park to participate in the "Ropes" course, a teambuilding, leadership development, and problem solving program presented by a team from the "Adventures in Confidence" organization of Hudson, Wisconsin.

12:00-1:00 Lunch at the Pawn

1:00-3:00 Automation

Campers learned the capabilities of computer controlled machinery in fabricating a wooden game board in the manufacturing laboratory. Two Partner mills were preprogrammed to process the boards. Four tool changes were required to countersink and drill a triangular matrix of 15 holes for wooden pegs, to route a well to store the pegs, and to etch the name of the camper into the face of the board. The camper was shown how to operate the machinery and to enter her name into the program. She

then mounted a blank board into the machine and turned it on. As the processes were performed, she was able to watch the tool path on the computer screen and observe the tool changes as they occurred. Golf tees were issued to be used as pegs. The campers ground off the sharp ends of the tees and sanded the rough spots on their boards. Using magic markers, they decorated the board as desired.

The instructor demonstrated the use of a Mazak turning center to machine an aluminum cylinder into a chess pawn. Each camper carried a chess pawn and a board game from the lab as souvenirs.

3:00-5:00 Computer Lab

Supervised by the team counselor, the team visited the campus computer lab where each camper was free to explore the World Wide Web. Suggested sites and areas of interest to search were provided.

5:00-6:00 Pizza Party

All of the campers and counselors gathered in the Student Center cabaret, Huff's, for a pizza party catered by Dining Services.

6:00-8:00 Karaoke

The campers remained in Huff's for a Karaoke party hosted by a local DJ. With an elaborate sound system and light show, he helped the campers celebrate their last night together with a wealth of activities, to include karaoke, line dances, games and contests, and popular dance tunes.

8:00-10:00 Snacks, Discussion, Quiet Time, Lights Out

FRIDAY

7:00-8:00 Breakfast at the Pawn

8:00-9:00 Wrap-up and Evaluation

The campers and team counselor held a final discussion in which the camp overall was critiqued. The campers completed a questionnaire that included the same questions as the one completed on the first day in additional to some additional items concerning the conduct of the camp as a whole. The campers also used this time to pack up their belongings and clean their rooms.

9:00-10:00 Shopping

Counselors escorted the team members to the campus bookstore to shop for souvenirs.

10:00-12:00 Graphic Arts

The campers toured the laboratories of the Graphic Communications Management program, an undergraduate major that supports the printing industry. They then assembled in the computer lab to lay out their page for the camp newsletter. Throughout the week the campers turned in articles which were then word processed and exposed film which was developed by a commercial one-hour processing facility. Pictures were selected and scanned in to a computer file. The text and photos were laid out on the team's page and electronically modified according to their design. A printing master was developed. Since this group was the last to participate in the printing activity, the masters for the entire newsletter were then delivered to the campus duplicating center for printing and binding. The campers also bound and trimmed their own notepad with the STEPS logo on each page.

12:00-1:00 Lunch at the Pawn

1:00-2:00 Graduation

The campers gathered in Micheels Hall Auditorium for the graduation ceremony. They were seated by team at the front of the auditorium. Parents, relatives and friends were seated in the rear. At 1:00, 250 copies of the completed newsletters were delivered. Each camper was given five copies.

The camp director summarized the activities of the week for parents and guests by showing a video of previous TV news reports about the camp and by briefly describing each of the activities of the week. The purpose of the camp was reiterated and the parents were asked to assist in the in the follow-up effort by encouraging the girls to complete and return questionnaires to be sent to them in future years.
The campers were then presented their diplomas individually by team. The certificates were each enclosed in official UW-Stout diploma folders that had been donated by the University Chancellor.

2:00 Check-out and Departure

Evaluation. The purpose of the camp was to inspire young ladies to pursue careers in engineering and technology. We will not have information to evaluate how successful the camp was in doing this for at least 6 years when the campers enter college and select a major.

A long-term project will be undertaken through the UW-Stout Admissions office to track their progress until they reach that point. Annually the campers will be sent a reminder of their STEPS experience at the University. They will receive campus newspapers, postcards, short reports concerning future STEPS camps, and other communications.

During their sophomore year in high school, they will be sent a questionnaire that will determine the role of STEPS in influencing their selection of math and science courses to that point and their career aspirations. As high school seniors, at the point at which they have made or are

making their college choice, they will be sent a similar questionnaire. The results will be compared against statistics for women enrolling in engineering programs as freshman nationwide. Their career choices will also be compared to the career interests they reported at the beginning of the camp this summer. Their interests vary widely now, as indicated by this list of possible careers that was generated by their response to the entry questionnaire:

Veterinarian	Chiropractor	Model	Secretary
Actor	Farmer	Mechanic	Architect
Teaching	Pediatrics	Accounting	Marine Biology
Lawyer	Scientist	Nun	Film Director
Zoologist	Bank Teller	Computer Scientist	Meteorology
Astronaut	Photographer	Singer	Director
Producer	Surgeon	Author	Child Psychologist
Dentist	Travel Agent	Masseuse	Pilot
Nurse	Librarian	Daycare	Interior design
Engineer	Aerospace Engineer	Biochemical Engineer	Packaging Engineer
Agricultural Engineer			

Although the information is somewhat perishable, two questionnaires were administered to the campers during camp. The first was given as the campers registered. It was designed to measure knowledge and aspirations prior to any camp activities. The second was administered on the last day of camp. While many of its questions were designed to provide input for improvement of the camp, key questions from the first questionnaire were repeated in order to evaluate immediate shifts in attitude toward and familiarity with engineering and technology as possible careers.

The percentages of responses to the first three questions are interesting:

Question		***Initial* Questionnaire**	***Final* Questionnaire**
I plan to go to college.	Yes	92.6%	94.4%
	Not sure	7.4%	5.6%
	No	0	0
I know what kind of work a scientist or engineer performs.	Yes	43.7%	89.3%
	Not sure	52.0%	10.7%
	No	4.2%	0
I would like to be an engineer or scientist someday.	Yes	12.5%	24.6%
	Not sure	69.2%	59.6%
	No	18.3%	15.8%

The camp obviously attracted a sample of girls with solid college aspirations. Of those, less than half reported a good understanding of engineering, science, and technology careers before the camp, but all were well informed as a result of it. While few had seriously considered

engineering or science as a career possibility before, the camp inspired many to start thinking about it.

Publicity. The camp was covered heavily by the press. It was featured in evening news broadcasts by KARE TV 11 (NBC) in Minneapolis, by WQOW TV 18 (CBS) in Eau Claire, and by WEAU TV 13 (NBC) in Eau Claire. The camp was also reported by the Eau Claire Leader-Telegram, the Sheboygan Press, and the Dunn County News. The Associated Press picked up the story and distributed it. The SME Newsletter featured the camp in its December issue.

The University is currently conducting a $6.5 million fund raising campaign to support the Packaging program. The packaging component of the camp was used to publicize the campaign. Several packaging journals published an article on the camp

A promotional video about the camp has been completed based upon footage shot by a film crew from the University's Learning Technologies Services during the third week.

Budget. The camp cost a total of $70,862.82 to produce. Finances for the camp came from several sources. A total of $40,000 was donated by four organizations: the Society of Manufacturing Engineers, the Ford Motor Company Fund, Honeywell, and the Stout University Foundation. The remainder was funded by University operating funds (Engineering and Technology Funds) allocated annually by the University of Wisconsin System for support of engineering and technology laboratories and activities.

The Future. Compared with other camps that they had attended, the campers rated STEPS at 96 on a scale of 1 to 100. Based upon the enthusiastic responses from campers, their parents, camp faculty and staff, University officials, the media, and visiting dignitaries, the camp was an overwhelming success. As a result, the camp has been established as an annual event and will continue to be conducted for the foreseeable future. Plans are already underway for the camp to be held in the summer of 1998.

The overall success of the camp will not be known for a number of years. However, the seed has been planted in the minds of several young ladies that they could have a promising future in the exciting and interesting career paths of engineering, science, and technology. This information will assist them significantly in eventually making a reasoned career choice. Along with their experiences, the girls took home with them tangible souvenirs of what they accomplished in camp, to include five copies of a newsletter documenting these experiences. There is no doubt that they will share their enthusiasm with teachers and friends, spreading the seeds of awareness and interest ever wider as ambassadors of engineering and technology.

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