6-2004

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Abstract
The purpose of this paper is to discuss the experience and positive results in this year's freshmen orientation at Rochester Institute of Technology (RIT). Before classes started in the fall freshman in Electrical, Computer and Telecommunications Engineering Technology (ECTET) programs were asked to work with faculty as they programmed an inexpensive robot and built maps of the RIT campus for the robots to navigate. The paper discusses these activities in detail, provides the tutorials that were developed and discusses the student survey completed after the orientation. The goals met in the orientation were: faculty-student interaction, student-student interaction, increased student knowledge of the campus, team participation by all, students meeting the office staff and, students working with their advisors to review their schedule before classes began.

Background
The ECTET college day discussed in this paper is part of a week long "New First Year Orientation" program organized by the Center for Student Transition and Support at RIT. The Center, in addition to organizing the New First Year Orientation, "assists new students with their transition and adjustment to RIT and, through specifically designed programs and services, works to foster the academic achievement, social integration and personal success of women, international, and first-year students."[1] This is accomplished through New First Year Orientation and the following programs: two required quarters of First-Year Enrichment which are extensions of the New First Year Orientation, International Student Services which is a primary resource for the over 1,200 hearing and deaf international students from over 90 countries, and a Women's Center that addresses the wide variety of issues affecting women.

Two years ago RIT re-designed the freshman orientation creating the New First Year Orientation program which provides students an opportunity to: 1) Meet the faculty and dean of the student's college; 2) Address the academic and social issues involved in beginning college or transferring from one college to another; 3) Attend academic planning sessions; 4) Experience living on campus and learn about student services; 4) Understand the family's role in promoting student achievement and success; 5) Learn about financing a college education; and 6) Participate in community and social activities. According to Robin Diana, who is responsible for the First Year Enrichment and Orientation, "prior freshman orientations were held during the summer with virtually no faculty involvement." This is contrasted with the New First Year Orientation which is held the week before classes start and is attended by almost all faculty and staff.

Program highlights of the freshman orientation are: 1) <u>academic advising</u> where each student has the opportunity to speak directly with an advisory and check their schedule before classes begin; 2) <u>college day</u> where faculty and staff create unique interactive activities and events to get acquainted with the students and have the students get to know each other; 3) <u>college life 101</u>

where students discuss academic and transitional issues first year students may face in the upcoming year; 4) "Two Worlds Together" presentation brings to light the issues hearing, deaf and hard-of-hearing students will have living together (the National Technical Institute for the Deaf , one of RIT's 8 colleges formed in 1968, supports 1200 students who are deaf or hard-of-hearing); 5) student identification cards and employment cards are obtained; and 6) week of welcome entertainment including comedians, dance parties, movies, picnics and athletic tournaments.

The Tinto Model[2] refers to the stages of passage in student college careers. The stages are separation from communities in the past, transition between high school and college and incorporation in the society of the college. The Freshman Orientation Committee's goal was to aid in the transition from high school into the college society. A smoother transition is more likely to end in improved student retention and satisfaction.

"Institutions with low rates of student retention are those in which students generally report low rates of student-faculty contact."[2] Students spent time working with faculty programming robots that, described later in the paper, did not always respond to stimulus as expected. This caused the teams of students and faculty to interact, testing more than just one person's ideas. A small celebration took place when the expected response was observed.

Student interaction with others was observed while they built room size maps of different parts of the campus. The goal here was to allow students to become more familiar with their new surroundings. Although most students preferred programming, a few really enjoyed the map building allowing all students to take part.

All fifty students had their schedule checked by their advisor during the activities. To do this with minimal interruption to the activities the students were divided into three teams with each team divided again into four groups of 4 or 5. Each team was assigned a different color and each group a different letter (A-D). Colored T-Shirts were provided to allow easy identification of team members while name tags were labeled with a group number. Every thirty minutes one group from each team was sent to the office for advising. The twelve students spent time getting to know the staff while they waited to be advised.

"Retention is an institution wide process linking academic, campus a student services."[3] According to RIT's Retention Committee report to President Simone "RIT's seven-year graduation rate for undergraduates has hovered around 60%." Retention has been studied and worked on for many years with a concerted effort seen in the last three years. The current goal of the institute is 75%. The College Days activities are seen as just a small part in a much larger retention effort. Increases in the percentage of students returning to RIT after their freshman year suggest RIT is making positive progress toward the institute goal.

College Day for ECT-ET Department Freshmen

The program for College Day was conceived by the First Year Orientation Committee within the ECTET department. The project, designed to meet the aforementioned goals, required the students to build 3-dimensional maps of portions of the campus and compete in a "robot race" through the campus maps. The entire process took place over the course of approximately 6 hours during two days. The first day consisted of learning how to program and control the robot, designing the course and constructing the map and campus buildings. All students were required to participate in all aspects of the project. Students competed for prizes in the categories of: 1) best Map; 2) fastest time to complete each individual course; and 3) fastest aggregate time to complete all three courses.

The incoming freshmen class was broken into 3 teams (Red, Green, Blue). Each team was assigned a faculty team leader and a set of faculty lab assistants. Once the teams were formed, with four groups in each, they were assigned a physical lab space to work and strategize as a group.

Red Team	**Green Team**	**Blue Team**
R_group1	G_group1	B_team1
R_group2	G_group2	B_team2
R_group3	G_group3	B_team3
R_group4	G_group4	B_group4

Table 1

Campus Map
Each team was assigned a section of the RIT campus. The team was instructed to build a scaled model of their assigned campus section. It was explained clearly that the campus models would be judged and a prize given for the best model. Each campus model was designed to occupy as much of a ten-foot by sixteen-foot area as possible. Each team built one of the aforementioned campus maps using foam core insulation and masking tape allowing a two-foot wide path for the IQBug to a predefined path.

At any given time, two or three members from each group worked on programming the IQBug and two or three members from each group worked on building the team map. Every thirty minutes, two members of each group exchanged places so that all of the group members had an opportunity to work on both the IQBug programming and map construction. An example of one set of map instructions is given below:

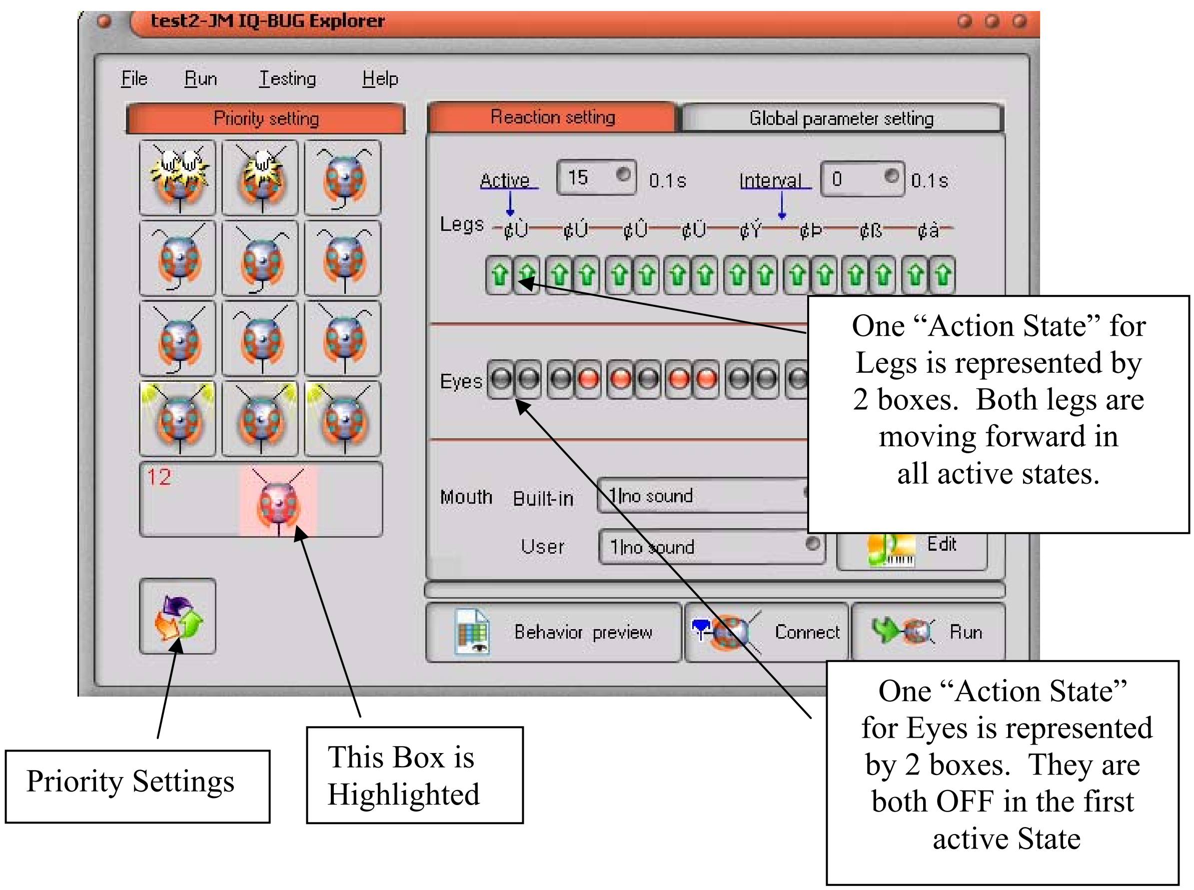
Team Color: Blue
Room: 70-1160 & 78-2120
Map: Academic

1) Start at **The Interfaith Chapel** on the quarter mile.
2) Travel west past the **Student Alumni Building**.
3) Turn north and go past the **Learning Development Center (LDC)**.
4) Continue north to the **Bausch & Lomb Building**.
5) Turn west and go to the **Image Science Center**.
6) Go southeast and then south through the corridor between the **Fine Arts and Gannett buildings**.
7) Continue south through the quad and east of the **Science Building**.
8) Go west staying north of the **Business Building** and the **Computer Building**.
9) Turn north, travel to **building 70** passing **building 13** on the west.

Robots and Programming Challenges

The second main activity was to program the robots to negotiate the campus models as efficiently as possible. The robot selected for this endeavor was the JM IQ-Bug from JoinMax Digital Technology. Each team of four was given a robot and used a laboratory computer to learn about programming and controlling the robot. Programming was performed via a somewhat cumbersome graphical user interface, and the instruction manual provided with the robot was very minimal. This required that a simple instruction manual be developed with some examples of programs that the students could readily use. The robot was able to respond to several forms of stimulus from a variety of sensors for control. There were three "feelers", two on the front, each at an angle of approximately 45° from center, and one at the rear. The bug could be programmed to behave in a specific manner for any combination of feelers being contacted, as well as for no contact at all. In addition to the feelers, the bug had two "eyes" or photo-sensors that responded to programmable levels of light stimuli. Again, the bug could be programmed to respond to stimulus in either eye, both eyes, or neither eye. Finally, the bug could be programmed to respond to sound, and could differentiate between one clap, and two successive claps. Once understood, the programming process was simple, flexible, and enjoyable. An example of the Graphical Interface demonstrating robot behavior for the "Normal" state when there is no external stimulus (highlighted box in lower left) is shown below in Figure 1.

Figure 1: JM IQ-Bug Graphical Interface Example



The IQ-Bug could respond in a variety of response patterns to the above stimuli, and could be programmed to perform a single cycle through the response pattern, or to continuously behave in a certain manner as long as the stimulus was present. Additionally, the sensors could be prioritized. The motion control of the IQ-Bug consisted of two wheels located directly beneath the center of the approximately six-inch diameter round robot. The level of control was fairly coarse, and permitted varying durations of either one wheel turning(either forward or backward), both wheels turning(direction independent), or neither wheel turning. In order to (theoretically) cause the robot to track a straight line, both wheels would be programmed to turn in either the forward or backward direction. Students soon realized that the robots did not track a very straight line, and that most progressed in a circular path when both wheels were programmed to turn at the same speed in the same direction. The result was that the students worked together extensively and solicited faculty assistance as they programmed, tested, and re-programmed and re-tested in order to achieve optimum robot behavior.

In order to cause the robot to stay on the prescribed path, students were permitted to manually strike the feelers with a yardstick, illuminate the photo-sensors with a laser, or make noise to stimulate the audio sensor. Ultimately, students developed a set of primitives for turning left or right, going straight, and reverse (hopefully). Programming modifications continued to be made throughout the competition as students strove to achieve the minimum time negotiating each course.

Competition
Friday was the day for the robot competition. After 3 hours of hard work on Wednesday, lots of other activities during the week long orientation and one and a half hours on Friday, the teams were excited to let the competition begin. Awards were given for the best model, the fastest group robot within a team and finally the overall fastest robot between the 3 teams.

<u>Best Campus Model Judging</u>

	Red Team	**Green Team**	**Blue Team**
Place(1st, 2nd, 3rd)			

Table 2

The staff from the department met with each team and judged their model of the campus. The staff used a list of criteria to accurately judge the quality of each team's model based on the map of their assigned section of campus. The winning team was presented a prize.

Fastest Group robot with in a Team

Red Team	Time	Green Team	Time	Blue Team	Time
R_group1		G_group1		B_team1	
R_group2		G_group2		B_team2	
R_group3		G_group3		B_team3	
R_group4		G_group4		B_group4	

Table 3

The groups for each team raced their robots first on their home model. Three attempts were allowed and the best time was recorded. Faculty members were assigned to time the robot and referee the competition. The winner of the race was then selected to represent the team. A prize was given for the each of the fastest group robots.

Fastest Team robot

Model	Red Team	Green Team	Blue Team
Red Model			
Green Model			
Blue Model			
Average Time			

Table 4

The team competition was the highlight of the event. The sliding doors were opened in the competition area and for the first time the teams were able to view the other campus models. The winner of this final competition was the number 1 team and the overall winner. Each team was given 3 attempts to complete the 2 foreign team's course. Again the best times were recorded. Once the times were recorded for each team on all three courses the average time was calculated. The team with the lowest time was declared the overall champion.

This activity was the best part of the week. Students and faculty were cheering for their team. People were laughing and joking as robots got stuck or suddenly malfunctioned while negotiating the course. People were taking pictures and enjoying the competition.

Student Survey Results

Most students agreed that programming the robot was enjoyable, interesting and allowed them to meet others. From observing the groups building the maps, most of the positive responses probably came from one group. This group built all sorts of neat items from the foam core for their map like elevators, washing machines, stairs, etc. This group had the best map by far and easily won the prize in the map category. Having both the programming and map building allowed all students to be involved. Students were very positive about the faculty, office staff and advisor involvement. The programming and competition were clearly the most popular events.

Compiled Survey Data

	Totally agree 5	Agree 4	Neutral 3	Disagree 2	Totally disagree 1	Average	Total
Programming the robot was enjoyable.	16	17	9	2	0	4.1	44
Programming the robot was interesting.	16	17	10	0	1	4.1	44
Programming the robot allowed me to meet others.	21	17	4	2	0	4.3	44
Building the map was enjoyable.	8	15	15	5	1	3.5	44
Building the map taught me more about RIT.	4	11	20	7	2	3.2	44
Building the map allowed me to meet others.	17	16	9	2	0	4.1	44
The competition was enjoyable.	20	22	2	0	0	4.4	44
The competition had good prizes.	17	18	5	3	1	4.1	44
The competition allowed me to meet others.	23	15	5	1	0	4.4	44
Where the Professors helpful and friendly?	24	17	2	1	0	4.5	44
Where the Office Secretaries helpful and friendly?	27	13	3	1	0	4.5	44
Where the Advisors helpful and friendly?	24	19	0	1	0	4.5	44
Best Part: Competition	15						
Best Part: Programming	13						
Best Part: Map	4						
Best Part: Prizes	2						
Best Part: Ice Cream	3						
Best Part: Meeting others	4						

Table 5

Summary

Several of the seven factors that are important in undergraduate education as described by Dr. George D. Kuh, President of the Association for the Study of Higher Education were addressed in the implementation of this orientation exercise[4].

1. Student-faculty contact
2. Cooperation among students (peer learning)
3. Active learning
4. Prompt feedback
5. Time on task
6. High expectations
7. Respect for diverse learning styles

Faculty members were assigned to each team and served as facilitators. There was a great deal of interaction between the faculty and students during the map-building and IQBug programming segments. During the competitions, faculty rooted-for their team to win.

Student cooperation took many forms in this exercise. Team members had to cooperate in order to build the map properly and program the IQBug in the short time allowed. Different teams often shared information with one another in order to overcome specific obstacles, the difficult to operate light sensors for example.

Since the students were almost immediately immersed in the project with only a short time to completion, active learning and prompt feedback were natural in this environment as was time on task. While the entire exercise was challenging, high expectations and respect for diverse learning styles deserve further study in the context of this competition.

One of the primary goals of this exercise was to give the students the opportunity to get familiarized with each other, the faculty, staff and campus in an enjoyable setting. In other words, develop a sense of community within the department. This goal was accomplished as evidenced by the survey results shown above.

Conclusion

Student feedback was quite positive and informal feedback from the department participants was also very positive. One of the students commented (on her/his evaluation form) *"At the end of the Orientation I felt like a part of the CAST family."* We are encouraged to continue and refine this activity by comments like this one and by the positive results achieved.

[1] RIT's Undergraduate Bulletin 2003-2004, http://www.rit.edu/~932www/ugrad_bulletin/services/csts.html

[2] Tinto, V (1993), Second Edition, *Leaving College: Rethinking the Causes and Cures of Student Attrition*, Chicago: The University of Chicago Press.

[3] Dr. Alan Seidman, www.COLLEGEWAYS.com, Retention Resources for Individual and Educational Institutions.

[4] Kuh, G., "What Matters in Undergraduate Education?", Chester E. Peters Lecture in Student Development, Kansas State University, April 10, 1997.

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