AC 2008-2112: GEO: A WEB-BASED EVENT REGISTRATION AND COMMUNICATION TOOL

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GEO: A Web-based Event Registration and Communication Tool

Abstract

The first-year engineering courses at Clemson University involve various out-of-class requirements, such as departmental tours, exams, team projects, and presentations. Enrollment in the first semester course typically exceeds 850 students, and the number of students who can attend any single out-of-class event has physical and logistical limitations. Additionally, because these students are unfamiliar with course guidelines, procedures, and each other, straightforward communication tools are vital to their success. A web-based system, GEO (General Engineering Online), was developed using PHP[1] (a programming language used to dynamically generate web pages) and MySQL[2] (a relational database management system). The system allows pre-registration for required out-of-class activities (department tours, advisor appointments, and team project work sessions). It also provides a portal for communication between students, instructors and advisors (peer evaluations, surveys, email confirmations of appointments, and student/team management). This study examines the capabilities of the GEO system from the viewpoint of students and faculty, as well as its pedagogical implications. The program and data structure are described, along with sample statistics generated by the system. Future directions include the development of GEOPort, an individual and team work documentation tool. This will transform GEO from a registration and communication tool into an education research tool. Team members will be able to post text, pictures, or video in response to instructor-posted materials, and to document their progress on projects and assignments. Rubrics can be developed to grade online submissions, and to track student approaches to design, problem-solving, and team dynamics.

Introduction

GEO (General Engineering Online) is a web-based software system developed for use by the first year engineering program at Clemson University. The intended goal of GEO is to assist instructors in classroom management to allow the instructor to focus more time on developing educational materials. As more features are added to GEO, it becomes apparent that the system has potential for assisting instructors research the performance of students in large enrollment classes, and the effectiveness of instructional innovations.

GEO utilizes a web-interface created with PHP[1] (a programming language used to dynamically generate web pages) and MySQL[2] (a relational database management system) running on an Apache[3] web server to eliminate the need for students or instructors to download any extra software. This also allows students and instructors running different web browsers and operating systems to access the same tools in GEO from in or out of the classroom. In the Fall of 2007, 75% of the students were running Windows XP, 15% Windows Vista, and 10% Mac OS X. Given the distribution of operating systems of first year engineering students, robust web-based solutions in the classroom are crucial for simple implementation in the classroom. This paper discusses the current features of GEO along with details about the functionality of each feature. The future features of GEO are discussed as well as a strategy for their implementation in the classroom.

Current Functionality of GEO

Event Registration

In the first semester engineering course, each student is required to attend three tours of different engineering departments. Each engineering department offers tours of varying capacity, duration, start times, and locations, so there is a great deal of logistical information to disseminate to each student. The number of tours offered has varied in the past between 2 tours and 30 tours, depending on how large or small the department prefers each tour, so a custom scheduling solution was required to handle all of the variables while providing an easy to use interface to assist with scheduling departmental tours. Other criteria for this system feature included reports to individual departments on the students who signed up for their tours, and reports back to the first year program on actual attendance.

The event registration component of GEO allows a faculty member to release departmental tours by typing in all of the details of each tour in the web-based administration interface. GEO handles the scheduling of each individual tour by providing a graphical calendar of events (Figure 1) to the student which allows each student to enroll themselves in their preferred tours. There are built in rules in the system that prevents students from enrolling in tours that are at capacity, and from enrolling in more than 3 tours without instructor permission. The administrative instructor has the ability to manually enroll a student in a full tour, if necessary. If a tour fills up, the administrative instructor has the ability increase the capacity of a tour. Furthermore, if any logistical details change after an event is released for enrollment, the administrative instructor can edit the tour and the information will propagate to each student enrolled in the event.
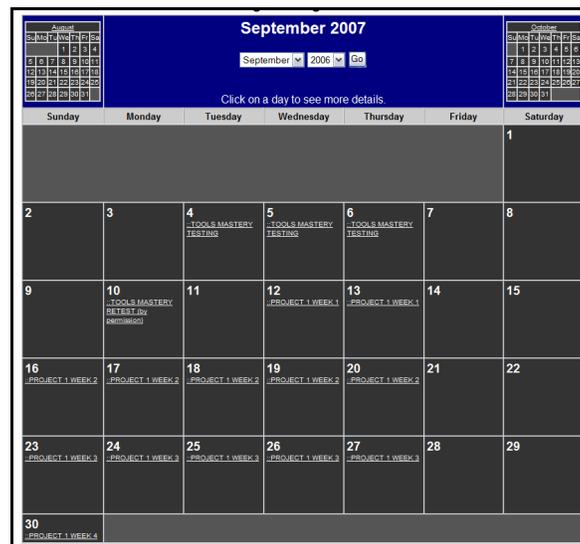

Figure 1: Events are presented to the student using a web-based calendar

In addition to departmental tours, the event registration component is also capable of handling team-based registrations. Students are required to complete team projects throughout the semester. To preserve in-class time for academic material, students are required to use the event

registration system to schedule out-of-class time in the project lab. The event registration system registers each member of the team after a single member enrolls for a project lab time slot. To prevent issues with overbooking the project lab or encountering a "renegade" member of a team, each member of the team must drop the project lab reservation before they can sign up for a different time slot.

Peer Evaluations

In order to measure individual effort in team projects, a peer evaluation component is included in GEO in order to allow each member of a team to submit evaluations of each member of his or her team. Since the submissions are turned in electronically, the students are able to honestly evaluate each member of their team while maintaining their privacy. All submissions are stored in the database and are only visible to the administrator, so each student does not know his or her individual rating before submitting a team evaluation. The students are asked to submit an integer rating of each team member, including themselves, on a zero-through-ten scale. This forces each student to think in relative terms about how much effort they put forth on the project in comparison to each member of the team.

CES 102 Peer Evaluation: Project 1

Directions:

Peer evaluations are a useful way for teams to communicate with each other and the professor about how the members of the team are performing. Reviewing and evaluating job performance is a marketable skill and is as useful to the employee seeking job advancement as it is to the supervisor. It is inappropriate to tell your other team members the specific ratings you gave them or ask what ratings they gave you. This is critical to ensure the confidentiality of the rating process.

When deciding a "rating" for each team member, including yourself, ask if that person:

- Does more or higher-quality work than expected.
- Makes important contributions that improve the team's work.
- Helps teammates who are having difficulty completing their work
- Asks for and shows an interest in teammates' ideas and contributions.
- Makes sure teammates stay informed and understand each other.
- Provides encouragement or enthusiasm to the team.
- Asks teammates for feedback and uses their suggestions to improve.
- Watches conditions affecting the team and monitors the team's progress.
- Makes sure that teammates are making appropriate progress.
- Gives teammates specific, timely, and constructive feedback.
- Motivates the team to do excellent work.
- Cares that the team does outstanding work, even if there is no additional reward.
- Believes that the team can do excellent work.
- Demonstrates the knowledge, skills, and abilities to do excellent work.
- Acquires new knowledge or skills to improve the team's performance.
- Able to perform the role of any team member if necessary.

On the lines below, rate each team member, INCLUDING YOURSELF, on a scale of 0 to 10.

Lab Section: 00614

JAMES ▢

BRITTANY E ▢

LAUREN E ▢

BRIAN G ▢

Make sure you have answered all questions before hitting submit!

[Submit] [Reset]

Figure 2: Peer evaluation interface

After all peer evaluations are collected, the administrator can export a Microsoft Excel workbook with all of the peer evaluation data for each student. Each row of the Microsoft Excel worksheet contains a single student with all the ratings assigned to that person by their team members. This allows the instructor to easily incorporate the peer evaluation data into a master grade sheet and quickly determine students who failed to complete a peer evaluation. GEO also contains tools to allow the administrator to quickly view, remove, or edit peer evaluation data. Students will not be able to view individual ratings, but will see an average rating after the final peer evaluation due date.

Survey

In order to eliminate the need for manual processing of survey data, a survey component was developed to release surveys to all students enrolled in the first year engineering course. The administrative panel contains an interface to build entire surveys from scratch giving the survey administrator full control over all questions asked. In order to allow different types of responses to questions, the response editor allows the administrator to create new response categories that allow manual input into text boxes, radio buttons, check boxes, or drop-down menus. The survey building tool allows the administrator to create or edit a survey, custom instructions, and questions associated with different response categories. All questions created are stored in a question pool and can be reused in a new survey at a later time. After completion of the survey, it can be released immediately or set up to release during a specific period of time. Additionally, the survey can be released to only a subset of the entire course by manually selecting students, teams, or entire lab sections.

Motivation, Attitude and Retention Post Survey

Directions:

Indicate how strongly you agree or disagree with each of the following statements by selecting the best representation of your opinion. When you are are finished, click Submit. You have one chance to submit this survey, so make sure all of your answers are complete.

1. I am having fun in my major.
   ○ Strongly Agree   ○ Agree   ○ Neutral   ○ Disagree   ○ Strongly Disagree

2. My overall attitude about my engineering department is positive.
   ○ Strongly Agree   ○ Agree   ○ Neutral   ○ Disagree   ○ Strongly Disagree

3. I can analyze and interpret data.
   ○ Strongly Agree   ○ Agree   ○ Neutral   ○ Disagree   ○ Strongly Disagree

4. I can function on problem-solving teams.
   ○ Strongly Agree   ○ Agree   ○ Neutral   ○ Disagree   ○ Strongly Disagree

5. I am committed to engaging in life-long learning
   ○ Strongly Agree   ○ Agree   ○ Neutral   ○ Disagree   ○ Strongly Disagree

Figure 3: Example of a Motivation, Attitude and Retention[4] created with a Likert[5] scale using the survey editor

Survey data can be viewed by the instructor while the survey is still active to gauge preliminary responses for each question. Data is displayed in a text-based fashion or as a histogram where available. Live and completed survey data that contain textual responses are searchable for keywords in the survey administration panel. Upon completion of the survey, the instructor can download a Microsoft Excel file containing survey data associated to each student or cumulative responses of all students taking the survey.

Student and Team Management

At the beginning of each semester, a student roster is created in Microsoft Excel document is created with each enrolled student's name, Clemson University user name, Clemson University user identification number, and lab section number. Through the administrative interface, the

roster is imported into the system and allows each enrolled student access to all of the components built into GEO. As the semester progresses, if a student withdraws from the course, the student can be removed through the administrative interface and student's activity on GEO is retained in the system until it is manually deleted. This allows the instructor to access any work, registrations, or surveys the student completed before withdrawing from the course.

Please Select The Team

Team 00301			Team 00303			Team 00304			Team 00305	
NAME	**USERID**		**NAME**	**USERID**		**NAME**	**USERID**		**NAME**	**USERID**
BARKSDALE LUCY BROWN	LBBARKS		NELSON CHRISTOPHER D	CN		KILPATRICK CHRISTOPH	CKILPAT		PHIPPS JOSHUA S	JPHIPPS
HESTIR JAMES RIVES	JHESTIR		NOBLE CORY OWEN	CORYN		CUTLER WILLIAM A	WCUTLER		RATHWEG SCOTT C	SRATHWE
CORTES JOHN	JCORTEZ		PRAYTOR RYAN Z	RPRAYTO		MEAD MATTHEW JAMES	MMEAD		REYNOLDS SCOTT D	SDREYNO
QUALLS DERRELL M	DQUALLS		WESTERVELT LUCAS C	LWESTER		O'LEARY MICHAEL JOHN	MOLEARY		RODIN KEVIN GEORGE	KRODIN
[Email Team]			[Email Team]			[Email Team]			[Email Team]	

Team 00307			Team 00309			Team 00310			Team 00313	
NAME	**USERID**		**NAME**	**USERID**		**NAME**	**USERID**		**NAME**	**USERID**
HOUGHTALING ERIKA N	EHOUGHT		BUSS MICHAEL TYLER	MTBUSS		FARQUHAR CAMERON W	CFARQUH		PUETTER DANIEL	DPUETTE
HARTMANN JOHN S	JSHARTM		BUTLER JAMES MATTHEW	JMBUTLE		PINCKNEY RICHARD R	RPINCKN		ZHANG YOU X	YOUZ
SARTAIN AMY K	ASARTAI		MCDOUGALD MORGAN A	MAMCDOU		REED JON PATRICK	JONR		HODGES ADAM JORDAN	HODGES8
SMITH CHARLOTTE M	CMS		RICHERSON ALISHA R	ARICHER					IHME JOHN NATHAN	JIHME
[Email Team]			[Email Team]			[Email Team]			[Email Team]	

Team 00315			Team 00316			Team 00317			Team 00318	
NAME	**USERID**		**NAME**	**USERID**		**NAME**	**USERID**		**NAME**	**USERID**
BOUTOT MATTHEW G	MBOUTOT		HELMS JOE TIERNEY	JOEH		BLUE DEVOY MICHAEL	DBLUE		MARTIN JOHN JACOB	JJMARTI
ROSCHE TRAVIS JAMES	TROSCHE		SMITH COREY WATSON	CWS		GRAVES JENNIFER C	JCGRAVE		WALFORD DEVIN V	DWALFOR
SANDERS MCINTYRE K	MSANDER		STORY EMERY GRANT	ESTORY		RICHARDSON CHRISTOPH	CRICHAR		FULMER JOHN ADAM	JAFULME
SMITH COLIN PETRIE	CPSMITH					YUHAS JEREMY DAVID	JYUHAS			
[Email Team]			[Email Team]			[Email Team]			[Email Team]	

Figure 4: Graphical team editor

Each first year engineering student is required to complete team projects throughout the semester. In order to assist with creating teams, there is a team administration interface that allows the administrative instructor to build teams of any size. As each team is created, the students are automatically provided with the name and e-mail address of each member of their team. In order for a team member or instructor to contact all members of a team, there are hyperlinks built in both the student's login page and the team administration page that open a blank e-mail addressed to each member of the team. If a student withdraws from the course and is removed from GEO, the team is flagged if the enrollment falls below a specified number (by default, 2) and the instructor is notified in case the team requires reassignment.

Advising Appointments

While there are typically more than 850 students enrolled in first year engineering courses, there are more than 1000 students currently majoring in General Engineering. Students that do not meet the requirements to switch into their intended majors are required to stay in the General Engineering program until they have fulfilled the entry requirements. This means that all of their academic advising occurs in General Engineering. Access to academic advisors, who provide insight into degree progress, career options, and real or potential problems, is especially important for those students who are considering switching majors. Of all the strengths and weaknesses that students acknowledge in advising, a lack of individual attention is one thing that students have difficulty accepting (Seymour and Hewitt, 1997). With retention in engineering becoming a major focus of engineering program resources, every effort should be made to give students the personal attention they need, as efficiently as possible, to inform their decisions regarding their future.

In order to balance the need for advising over 1000 students with a finite number of available advising appointments, a component was added to GEO in the fall of 2007 to manage all appointments with advisors. The advisor appointment component allows any student with a valid Clemson University email address and identification number to create an account on GEO, separate from the course roster, to make appointments with academic advisors. Before the student can confirm the appointment, the student must specify the reason for the appointment (time management, personal counseling, changing major, etc) by selecting an option from a list. This allows the advisors to prepare materials in advance. After an appointment is created, the student receives an email with the details (date, time, location, phone number in case of emergency) about the appointment. This creates a receipt for the appointment in case there are any issues concerning the appointment. The advisor appointment component of GEO creates an up-to-date set of data that shows the distribution of the types of appointments General Engineering students requested with their advisors.

Figure 5: Sample advisor schedule as viewed by a student

The academic advisors are able to manage their own availability administration through a user friendly administration interface. Advisors can set their appointment availabilities either using a day by day editor or using a bulk-scheduler to set availability for days or weeks at a time. The administrator can quickly view all appointments with advisors within a week. Statistics, such as the percentage of time the advisor is available in a 40 hour week and percentage of available appointment utilization, are available to help the advisors determine whether they should create more availabilities for student appointments. The administration panel allows the advisors to add or remove categories of advising meetings in case there are any seasonal reasons for appointments. In order to view appointments, GEO generates a live iCal (Internet calendar) file, which is viewable on Microsoft Outlook 2007.

Future Functionality of GEO

Classroom Seat Assignment Generator

 A desirable feature of GEO would be one that fulfills the need for a system to keep track of student seating in large enrollment classrooms. The classrooms used in first year engineering courses at Clemson University range in capacity between 72 and 144 students. Developing correct and up to date seating charts for courses as attendance fluctuates and team assignments change is a tedious problem in classes with more than 850 students enrolled.   A new component for the administrative side of GEO will generate seating charts for different classrooms based on the layout of the classrooms, capacity for each table or row, and team assignments for each student in the course. In order to allow teams to communicate and work together in class, all seating charts are required to place students in teams at different tables. The class seating generator will allow the instructor to manually override seating requirements, such as requests for disabled students, and the system will move automatically move teams in order to facilitate a student's disability.

The proposed system will contain a classroom designer that will allow the administrator to design the classroom based on the style of seating (eg. rows, tables, or individual desks). After the classroom is designed and class seating is generated, the instructor will be able to print off individual table seating charts as well as a master seating chart in order to assist with keeping track of attendance.

GEOPort: Web-based Team Work Documentation Tool

The latest proposed addition to GEO will transform the system from being a classroom management tool to containing educational research tools to assist with evaluating student documentation on individual work and team projects. GEOPort (GEO Portfolio) will allow students to utilize a web-based graphical text editor to submit writings, images, and video documentation of work completed in first year engineering courses. There is a recent requirement for all students at Clemson University to create and maintain an ePortfolio[6] (electronic portfolio) of their course work. The required ePortfolio contains a number of different competencies to demonstrate the student's abilities and potential for success. GEOPort will allow a student to export any material they submit for easy inclusion in their ePortfolio.

In addition to exporting material to include in an ePortfolio, GEOPort will provide an interface to create a rubric for evaluating submissions from a student. Rubrics and be created from scratch for each assignment or reused from a previous assignment. The administrator will be able to generate rubrics containing requirements expressed using check boxes, radio buttons, drop-down menus, or text boxes for manually typing in responses. After the instructor selects the rubric, the grading interface will allow the instructor to view the grading rubric beside each student's submission to allow the instructor to provide quick, but detailed feedback to each student or teams work. When all student submissions are evaluated, the administrator will be able to download either the overall score or the scoring of each individual part of the rubric as a Microsoft Excel document.

Pedagogical Impact and Innovation

The components of GEO assist instructors with managing students and assignments through an easy to use interface, but the data collected provide important student evaluation mechanisms and research tools for various aspects of student activity. The event registration component requires each student to decide which three engineering majors best suit their interests. The data collected can be compared to the intended major specified during the application process and the actual major they select after completing all of their general engineering requirements. Analysis of student major selection data could be used to flag students who may be interested in alternate engineering disciplines than they originally intended, or to provide innovative career information within their intended disciplines. The peer evaluation component provides a mechanism to research freshman engineering team dynamics in first year courses. The adjustability of the peer evaluation system allows the administrator to specify which traits should be evaluated by each team member, and provide insights into various aspects of team dynamics. Results of prior research in peer evaluation data, such the CATME[7] system, have demonstrated the importance of evaluating team dynamics. The survey component allows the instructor to directly assess the effect of pedagogy and classroom innovation. Since the survey tool is built in to a familiar system, there is a greater chance that students will complete surveys. The results of analysis of team dynamics and event registration data can be used as the basis for creating class seating charts in the seat assignment component of GEO. Creating course seating and team assignments based on the results of prior data would provide further analysis of how team dynamics are affected by clustering similar students. GEOport will provide an important tool to assist in the development of rubrics for grading online submissions. Tracking submissions will allow the instructor to seek out common student deficiencies in order to provide supplemental instruction if necessary. All of the components of GEO together provide a mechanism to evaluate and research various aspects of student performance in one common system.

Conclusion

GEO is an effective tool for assisting in the management of large enrollment courses. Development of new features on like GEOPort in the future will allow the use of the system as an educational research tool to accurately evaluate student work completed individually or in teams. Utilization of GEO in a large enrollment classroom allows instructors to focus their work on the education each student and less on the details involved with classroom management.

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