ENABLING TECHNOLOGIES FOR EFFECTIVE STUDENT ADVISING

Paul D. Plotkowski, Andrew Sterian, Jeffrey L. Ray

Padnos School of Engineering
Grand Valley State University

Abstract

Engineering degree programs are, by their nature, very structured with extensive prerequisite systems. Because of this, student advising often degrades to the level of updating records and assisting students as they navigate the proper sequence of courses [1]. This situation can be substantially changed if both the faculty advisor and the student are provided with a larger view of the entire undergraduate curriculum including major and general education requirements and sequencing.

Utilizing database management software and web tools, a system has been implemented that provides both students and faculty advisors with timely and accurate student program data. The information is presented in an easy-to-understand format that is effectively utilized in advising. Providing this information changes the dynamics of an advising session, and allows students and their faculty advisors to focus their conversations on forward planning rather than bookkeeping.

Introduction

Proper academic advising has always been important to student success in engineering programs. In recent years, additional pressure has come to bear on universities from state legislatures to ensure timely graduation of students and from accrediting bodies to provide accountability for student advising [2]. Recent surveys report that the proportion of college students who graduate in 4 years is steadily declining [4]. Essential to the success of any advising program are accuracy and consistency of information and the customization of materials to the needs of each student. Student success is influenced not only by advising with regard to university processes and procedures, but more importantly, by helping each student understand university level-academic expectations [3].

The Padnos School of Engineering at Grand Valley State University has introduced several programs and tools to facilitate consistent and accurate student advising. These initiatives begin early in the orientation/registration process and continue throughout the student's academic career. Central to these efforts are the use of technology to assist in student exploration and the

automatic generation and updating of personalized advising materials such as study plans and graduation audits. These tools are particularly important in the current era of on-line, multi-semester student registration.

We believe that our advising system represents a new approach to planning and advising, which translates into an improved educational experience for our students.

Background

Grand Valley State University is a comprehensive, regional university with an enrollment of 20,500 students. The University has a strong focus on undergraduate education. It is a tradition that every engineering student is matched with an engineering faculty member advisor as soon as they are admitted to the university.

Several factors have led to challenges in student advising. The first of these is growth. GVSU has been the fastest growing university in the state of Michigan for several years. University enrollment has increased by over 60% in the last decade. Engineering enrollment has increased by 168% and the number of engineering faculty has increased by 150% during the same period.

In parallel with this rapid growth, several factors that are increasing the complexity of the advising role of the faculty member include:

- Full year scheduling of and by students
- The continuing evolution of the engineering degree programs
- Introduction of a new general education program by the university
- Increasingly diverse academic preparation of entering students
- An ever expanding desire by students to augment their engineering program with other academic programs such as honors, music, and computer science.

These factors would have combined to seriously overwhelm our old advising system. The university and the engineering school have launched several initiatives to maintain the close relationship between the students and faculty while continuing to provide accurate advising.

Enabling Technologies

The two major technologies that have been most instrumental in assisting with student advising have been database management systems and the web. The university was very early in the introduction of a computerized records database system in 1986. The backbone product in use is IDMS-R provided by SCT. Since its introduction, this system has allowed for faculty review of student transcripts. In 1990, this system was expanded to provide an automated graduation audit. This feature expanded the information available to an advisor at his or her desktop to include the student's Assessment of Academic Progress report. This on-line report indicated:

- Courses performance in an alphabetical listing

- Graduation requirements not yet completed, by category for general education, major and minor
- Graduation requirements completed, by category for general education, major and minor
- "What-if" evaluation of graduation requirements based upon changes in major, minor, and catalog year.

This tool provided great assistance to the faculty advisor, but had two major limitations:

- Viewing of this information was only possible by faculty who had access and training. Students were provided a copy of this report each semester in preparation for registration.
- The information was not presented in the chronological "study plan" format that we have found to be most effective for advising students. This required that staff transcribe the student grade information onto the study plans that are maintained for each student.

With the maturing of the Internet, the university addressed the first of these problems in 1999. Beginning in that year, students have been provided with on-line access to all of their records. This includes:

- Transcript
- Assessment of Academic Progress
- Mid-term and final course grades
- Declaration of major and/or minor
- Individual schedule of classes
- On-line registration
- Finances, financial aid, and housing

An example of an assessment of academic progress report is shown in Figure 1. Only a few parts are shown, as the whole report extends over several pages. A full report example is available at: <http://claymore.engineer.gvsu.edu/~steriana/form3.pdf>.

This tool eliminated all ambiguity with regard to student records information. At the same time, the Padnos School of Engineering began posting the engineering study plans to our web page. This allowed students to download an appropriate study plan for updating at the end of each semester.

Still remaining, however, was the need to manually transcribe student grades onto (now nearly 700) individual study plans each semester. This task was addressed most recently.

Due to the age of the university student database software, and for security reasons, the information maintained in the student records system is not easily accessible. During the 2001-2002 year a system was developed by the engineering faculty to integrate the information from the student records system with individual study plans. The system captures a snapshot of the university database records for engineering students using an X3270 terminal emulator and a set of Python script files for automation. These records are then parsed and compiled into a custom

ANALYSIS OF ACADEMIC PROGRESS
MINIMUM GRADUATION REQUIREMENTS FOR A
BACHELOR OF SCIENCE IN ENGINEERING S
MECHANICAL EMPHASIS
CATALOG 2001 FALL

THIS EVALUATION IS PROVIDED FOR ADVISEMENT. PLEASE REPORT ANY ADDITIONS OR CORRECTIONS TO THE STUDENT ASSISTANCE CENTER, (616) 555-3327.

- - - - - - - - - SUMMARY OF CREDIT TOWARDS GRADUATION - - - - - - - - - -

INSTITUTION	PASSED	IN PROGRESS	N/A	GPA	VARIANCE
GRAND VALLEY STATE UNIVERSITY	32.0	13.0		3.491	
GRAND RAPIDS COMMUNITY COLLEGE	39.0				
	71.0	13.0		3.491	

- - - - - - - - - SUMMARY OF CREDIT TOWARDS GRADUATION - - - - - - - - - -
(CONTINUED FROM PREVIOUS PAGE)

GPA DESCRIPTION	REQUIRED	APPLIED	N/A	GPA	VARIANCE
ENGINEERING MAJOR REQUIREMENTS	127.0	54.0		3.491	

(a)

2. - - - - - - - - - ENGINEERING GENERAL ED REQUIREMENTS - - - - - - - - -
(CONTINUED FROM PREVIOUS PAGE)

A. COMPLETE 1 COURSE OF THE FOLLOWING: ECO 210, 211
B. COMPLETE 1 COURSE OF THE FOLLOWING: BIO 103, 105, 111, 112 THRU 032, BIO 120
C. AN APPROVED 2 COURSE SEQUENCE IN THE HUMANITIES AND IN THE SOCIAL SCIENCES IS REQUIRED. CONSULT WITH YOUR ADVISOR.

3. - - - - - - - - - MECHANICAL ENGINEERING FUNDAMENTALS - - - - - - - - -
A. FOR THE MECHANICAL ENGINEERING EMPHASIS COMPLETE THE FOLLOWING WITH A MINIMUM GRADE OF 'C': EGR 250

4. - - - - - - - - - - - ADMISSION TO MAJOR STANDING - - - - - - - - - - -
THE FOLLOWING WORK IS REQUIRED FOLLOWING FORMAL ADMISSION TO THE SCHOOL OF ENGINEERING.

5. - - - - - - - - - MECHANICAL ENGINEERING EMPHASIS - - - - - - - - - -
A. COMPLETE THE FOLLOWING 7 COURSES: EGR 309, 312, 345, 360, 365, 409, 468
B. COMPLETE 3 COURSES FOR A MINIMUM OF 11 HOURS FROM THE FOLLOWING: EGR 350, 352, 367, 370, 430, 450, 469, 470, 475

(b)

Figure 1: Excerpts from the assessment of academic progress report.

database using the GDBM database technology.

Our database snapshot is then uploaded to a secure Apache web server. This server uses Python CGI scripts to provide a web interface to the database contents. The web interface also allows for the maintenance of a separate annotation database (also using GDBM) that is used to indicate course substitutions, waivers, etc. These annotations are entered by approved faculty and staff.

The two main reports from our web system are a one-page study plan report and an audit form used in the admissions process. Both are customized with transcript information for each student. An excerpt of a study plan report is shown in Figure 2. A complete study plan and audit form example is available at <http://claymore.engineer.gvsu.edu/~steriana/form1.pdf> and <http://claymore.engineer.gvsu.edu/~steriana/form2.pdf>. These reports are generated using LaTeX typesetting tools and converted to PDF before being served to the web client.

The study plan report may be customized based on the student's catalog year, major, and

STUDY PLAN FOR B.S.E. WITH ***MECHANICAL EMPHASIS*** (2001-2002 CATALOG)
(MTH 122/123 Placement)

First Semester: Fall					**Second Semester: Winter**					**Sprii**
MTH 122	**GRCC**: MA 131	(3)	A	W02	MTH 201	**GRCC**: MA 133	(5)	B+	W02	____
MTH 123	Trigonometry	(3)	_____	_____	EGR 101	Egr. Principles I	(3)	A	S02	____
WRT 150	**GRCC**: EN 101	(3)	A	W02	CHM 115	Chemistry I	(5)	B+	S02	
EGR 100	Intro. to Engr.	(1)	_____	_____	GE-Art	_____	(3)	_____	_____	
FS 100	Freshman Sem.	(1)	_____	_____						
Third Semester: Fall					**Fourth Semester: Winter**					**Sprii**
MTH 202	**GRCC**: MA 134	(3)	B+	W02	MTH 203	**GRCC**: MA 255	(4)	A	W02	____
EGR 103	Egr. Principles II	(3)	B+	W02	PHY 230	Physics I	(5)	A	W02	____
CS 162	**GRCC**: CO 127	(3)	B-	S02	PHI 102		(3)	B-	F02	
ECO 210	Economics	(3)	_____	_____	BIO 105	(103,111,112/HS202)	(3)	_____	_____	
Fifth Semester: Fall					**Sixth Semester: Winter**					**Sprii**
PHY 234	Egr. Physics II	(4)	B	F02	MTH 302	**GRCC**: MA 257	(4)	C+	S02	EGR
EGR 209	Statics & Solids	(4)	A	F02	STA 314	Stat. Qual. Meth.	(3)	***	W03	____
EGR 226	Intro. Digital Sys.	(4)	B+	F02	EGR 214	Circuit Analysis I	(4)	***	W03	
EGR 289	Egr. Co-op Prep.	(1)	A	F02	EGR 280	Materials Science	(3)	***	W03	
Seventh Semester: Fall					**Winter**					**Eigh**
EGR 312	Dynamics	(3)	_____	_____	EGR 390	Egr. Co-op II	(3)	_____	_____	EGR
EGR 345	Dyn. Sys. Mod.	(4)	_____	_____	_____			_____	_____	EGR

Figure 2: Excerpt from a customized study plan report

mathematics starting point. This report shows both engineering requirements and general education requirements remaining on the same page.

Implementation of this system has eliminated the need for clerical staff to "post" student grades to study plans each semester. Rather, reports can be quickly generated for one student, a predetermined group of students, or for all engineering students on demand. Our current practice is to print these reports shortly after course grades are posted at the end of each semester. New reports are added to the student files and past reports are retained for continuity.

Implementation and Utilization

Summer Orientation - Student advising and use of the technologies described above begins with freshman orientation. Expanding upon the university program, the engineering faculty conduct orientation sessions for groups of 20 – 30 students throughout the summer. These sessions include:

- Overview of the university general education program requirements
- Overview of the engineering programs and degree requirements
- Mathematics placement testing
- Identification of the correct study plan for each student based upon major and math placement
- Training in the use of the computerized on-line student records system
- Development of fall and winter semester class schedules and registration by each student

- Distribution of the engineering student handbook and an overview of policies

Fall Orientation – Experience has shown that, by the end of a summer orientation session, the students are "on sensory overload." To divide the material presented into digestible portions, we have introduced a fall orientation that is held on the Friday prior to the beginning of classes. At this orientation we address:

- University and engineering school expectations
- Academic integrity
- Engineering facilities and use policies
- The role of professional societies
- Use of the university network, the student e-mail system, the engineering school web site, and the Blackboard system utilized by many instructors
- Time management
- Taking notes
- Interacting with faculty

Ongoing Advising – The tools that are in place provide for timely, up-to-date, and accurate information for each student. A file is maintained for each student containing all advising materials and copies of all correspondence with the student. It is a tradition at GVSU that each student is advised by a faculty member in his or her own academic department. As mentioned earlier, students register on-line for an entire year of classes in the spring or summer. Students are strongly encouraged to review their progress with the faculty at the end of each semester. This allows for adjustments that may be necessary due to class performance or changes in the student's academic program.

Engineering School Admission – The engineering degree programs at Grand Valley are secondary admission programs that include a year of cooperative education work experience for each student. That is, students are reviewed for admission to the engineering school based upon performance in the first two years of the program. Students are reviewed for admission to the engineering school and into the co-op program based upon grade calculations as well as application materials and interviews.

The tools described earlier play an important role in preparation for admission. The information these tools provide facilitates continuous and close monitoring of progress by the student and the faculty advisor as well as accurate and timely data for review of student performance at the end of each semester. Prompt updating of student study plans and calculations of each students g.p.a. in prescribed courses is essential at the midpoint of the sophomore year.

During the week between the end of the fall semester and the holiday break, it is our practice to review applicants to the engineering school and grant preliminary admission. This "quick turn around" allows us to correspond with the students prior to the beginning of the winter semester and advise them of their standing and any adjustments that might be necessary.

Advance Course Planning, Preparation for Graduation and Auditing – The system in place allows faculty to quickly view study plans that show the courses the students have completed, and to assist them in planning their junior and senior year classes. This includes both upper level required and elective courses. By avoiding the need to spend precious time on clerical matters, the faculty are able to discuss career aspirations with the students and build a plan of study that is most appropriate.

Grand Valley has a strong liberal arts tradition. As a result we have a substantial general education program that includes upper level course requirements. It is a logistical challenge for engineering students to blend the engineering school requirements with the general education program. It is only through careful and continuous review of student progress that this is successful. The timely updating of the student study plans is essential to this process.

The final auditing process relies upon the automated Assessment of Academic Progress report. Upon receiving a request for graduation audit from a student, an academic progress report is generated and forwarded to the appropriate faculty advisor. The faculty advisor is responsible for reviewing the report and indicating any substitutions that may not already have been entered. The report is then reviewed by the Director of the engineering school and forwarded to a central office for general education review.

Conclusion

The goal of academic advising is to rise above the clerical level and assist students in career planning and development. These efforts should include, at a minimum, discussions regarding preparation for a particular career path or graduate school program. Activities such as planning appropriate upper-level courses should flow from these discussions.

This type of advising takes place much more often and effectively when proper tools are in place to facilitate the more mundane but essential tasks associated with basic course scheduling. The software tools utilized by the Padnos School of Engineering at Grand Valley State University provide this infrastructure.

Introduction of these tools has produced several positive changes. These include improved satisfaction among faculty and students, and more timely and accurate updating of student records while simultaneously lessening the clerical workload.

References

[1] Woolston, Donald C. *"Improving Undergraduate Academic Advising in Engineering: It's Not Rocket Science."* Proceeding of the 32nd ASEE/ISEE Frontiers in Education Conference, November, 2002.

[2] Accreditation Board for Engineering and Technology. *2002-2003 Criteria for Accrediting Engineering Programs.* Available on the web: http://www.abet.org.

[3] Habley, Wes. "Faculty Advising: Practice, Performance, and Promise" in *Reaffirming the Role of Faculty in Advising.* NACADA Monograph #1, Manhattan, KS, 1995.

[4] Rooney, M. *Fewer College Students Graduate in 4 Years, Survey Finds*, in The Chronicle of Higher Education, 03/19/03.

PAUL D. PLOTKOWSKI is the Director of the Padnos School of Engineering at Grand Valley State University. He obtained his BSME, MSME, and Ph.D. from Oakland University. His activities have led to the development and growth of several undergraduate and graduate engineering programs. Dr. Plotkowski is active in ABET accreditation and has served at the international level of ASME.

ANDREW STERIAN is an Assistant Professor in the Padnos School of Engineering at Grand Valley State University. He obtained the B.A.Sc. degree from the University of Waterloo and the M.S.E. and Ph.D. degree from the University of Michigan. He teaches courses in digital systems, microcontrollers, and signal processing. His interests include embedded hardware and software design, robotics, and free software development.

JEFFREY L. RAY is an Associate Professor of Engineering in the Padnos School of Engineering at Grand Valley State University. He holds a BS and MS in Mechanical Engineering from Tennessee Technological University and a Ph.D. from Vanderbilt University. His primary teaching responsibilities are First-year engineering courses and coordinating the Senior Capstone Design sequence.