

Tracking Engineering 2+ Students

Caroline Hembel Beard
Georgia Southern University

Abstract

Any institution that tracks students who transfer from a 2+ program to a full engineering program faces an additional burden in attempting to document program success rates. In the past an institution might simply choose to ignore its 2+ programs when reporting student completion in its annual IPEDS-GRS (Integrated Postsecondary Education Data System Graduate Rate Survey) report. Beginning with the 1999 report, the US Department of Education's National Center for Educational Statistics requires that IPEDS-GRS include data on transfer students, treating transfer programs in the same manner as associate degree programs. This obligation to report introduces a number of complex tracking issues for institutions with such programs, in that students who begin their college careers in transfer programs frequently take a path other than completion of the 2+ program, acceptance by the sister institution, and graduation with a bachelor's degree in engineering.

IPEDS-GRS compliance places institutions with 2+ transfer programs in a position of having to justify the completion rate from such programs. Any institution with a transfer program would therefore be wise to avoid the appearance of a high drop-out or failure rate by tracking 2+ students' completion and success rates beyond its boundaries. Obstacles to such tracking include the following:

- Multiple, shifting, and conflicting data sources that may result in loss of student completion information or render any information suspect.
- Federal regulations that do not appear to make any provision for calculating time-to-completion for co-op students.
- Transfer program students who apply to 4-year programs independently.
- Students who enroll in an engineering transfer program but change majors.
- No institutional structure in place for following a student whose ultimate success occurs after that student has left the originating institution.

This paper discusses some options for more accurately portraying the success of students who initially enroll in transfer programs.

I. Introduction

Public demand that education address assessment and accountability issues has set into motion inquiries into educational attainment at every level. From kindergarten to Ph.D. degree, from course to discipline, educators, administrators and researchers are probing inputs, through-puts and outputs to determine rates of success and failure. Rare is the program or institution that is not involved in a review, accreditation or strategic planning effort at any given moment. We conduct formative and summative evaluations of student learning, student evaluation of courses, peer evaluation of teaching ability, and follow-up studies from program level to institution. We review attrition, failure and completion rates. We compare student outcomes to stated course objectives, program goals in relation to the institution's mission statement. But how do we evaluate a program whose mission is to prepare students to leave the institution in order to reach the goal? Specifically, how does a pre-professional program — such as an engineering transfer program — account for the success or failure of its students?

34 CFR Part 668: Student Assistance General Provisions; Final Regulations

SUMMARY: We amend the regulations governing the disclosure of institutional and financial assistance information under the student financial assistance programs authorized under Title IV of the Higher Education Act of 1965, as amended (Title IV, HEA programs). These programs include the Federal Pell Grant Program, the campus-based programs (Federal Perkins Loan, Federal Work-Study (FWS), and Federal Supplemental Educational Opportunity Grant (FSEOG) Programs), the William D. Ford Federal Direct Loan (Direct Loan) Program, the Federal Family Education Loan (FFEL) Program, and the Leveraging Educational Assistance Partnership (LEAP) Program (formerly called the State Student Incentive Grant (SSIG) Program). These regulations implement statutory changes made to the Higher Education Act of 1965, as amended (HEA), by the Higher Education Amendments of 1998. DATES: Effective Date: These regulations are effective July 1, 2000.

Sec. 668.45 Information on completion or graduation rates. (a)(1) An institution annually must prepare the completion or graduation rate of its certificate- or degree-seeking, full-time undergraduate students, as provided in paragraph (b) of this section. (2) An institution that determines that its mission includes providing substantial preparation for students to enroll in another eligible institution must prepare the transfer-out rate of its certificate- or degree-seeking, full-time undergraduate students, as provided in paragraph (c) of this section.²

Figure 1: Department of Education 1998 Amendments to Title IV of the Higher Education Act of 1965

The impetus for tracking college students' success rate arises from the 1998 Amendments to Title IV of the Higher Education Act of 1965, as follows:

In their 1999 publication, "Tracking Institutional Leavers: . . .," DesJardins and Pontiff pointed out that "The exercise of tracking students beyond the walls of the matriculating

institution has gained importance since the issuance of the final rules of the Student Right to Know and Campus Security Act (SRK) and the imposition of the IPEDS Graduation Rate Survey (GRS).” DesJardins and Pontiff go on to say that, “SRK regulations require an institution that participates in any student financial assistance program under Title IV of the Higher Education Act of 1965, as amended, to disclose information about graduation or completion rates to current and prospective students.”¹

34 CFR Part 668: Student Assistance General Provisions; Final Regulations. . . . Sec. 668.41 Reporting and disclosure of information.

(C)(1) An institution annually must distribute to all enrolled students a notice of the availability of the information required to be disclosed pursuant to paragraphs (d), (e), and (g) of this section, and pursuant to 34 CFR 99.7 (Sec. 99.7 sets forth the notification requirements of the Family Educational Rights and Privacy Act of 1974). The notice must list and briefly describe the information and tell the student how to obtain the information.

(2) An institution that discloses information to enrolled students as required under paragraph (d), (e), or (g) of this section by posting the information on an Internet website or an Intranet website must include in the notice described in paragraph (c)(1) of this section--

- (i) The exact electronic address at which the information is posted; and
- (ii) A statement that the institution will provide a paper copy of the information on request.

(d) General disclosures for enrolled or prospective students. An institution must make available to any enrolled student or prospective student, on request, through appropriate publications, mailings or electronic media, information concerning--

- (1) Financial assistance available to students enrolled in the institution (pursuant to Sec. 668.42);
- (2) The institution (pursuant to Sec. 668.43); and
- (3) The institution's completion or graduation rate and, if applicable, its transfer-out rate (pursuant to Sec. 668.45). In the case of a request from a prospective student, the information must be made available prior to the student's enrolling or entering into any financial obligation with the institution. . . .

- (1) (i) An institution of higher education subject to Sec. 668.47 must, not later than October 15 of each year, make available on request to enrolled students, prospective students, and the public, the report produced pursuant to Sec. 668.47(c). The institution must make the report easily accessible to students, prospective students, and the public and must provide the report promptly to anyone who requests it.
- (ii) The institution must provide notice to all enrolled students, pursuant to paragraph (c)(1) of this section, and prospective students of their right to request the report described in paragraph (g)(1) of this section. If the institution chooses to make the report available by posting the disclosure on an Internet website or an Intranet website, it must provide in the notice the exact electronic address at which the report is posted, a brief description of the report, and a statement that the institution will provide a paper copy of the report on request. For prospective students, the institution may not use an Intranet website for this purpose.

(2) An institution must submit the report described in paragraph (g)(1)(i) of this section to the Secretary [of Education] within 15 days of making it available to students, prospective students, and the public.²

Figure 2. Reporting and Disclosure of Information

Specifically, the final rules state the following:

In calculating the transfer-out rate . . . an institution must count as transfers-out students who by the end of the 12-month period ending August 31 during which 150% of the normal time for completion or graduation from the program in which they were enrolled has lapsed, have not completed or graduated but have subsequently enrolled in any program of an eligible institution for which its program provided substantial preparation.¹

Any institution whose students receive Federal financial aid to help fund their higher education must comply with the 1998 Amendments to Title IV Higher Education Act of 1965. The stated purpose for reporting graduation and transfer-out rates is to inform prospective students, enrolled students, the families of students, and the general public concerning the institution's ultimate value, i.e., educational attainment, in relation to the institution's cost and risks. (See Figure 2. Reporting and Disclosure of Information) In fact, this information will inevitably be used as a further indicator of an institution's quality and effectiveness. When completion numbers and transfer numbers are available, every program will use the favorable numbers to highlight its strengths; and its competitors — within and outside the institution — will look for something in the numbers to make them look superior by comparison. For better or worse, all institutions with transfer programs must track and report their completion rates, and those rates need to reflect a positive success rate for the institution. Simply reporting the number of students who officially complete probably will not accomplish that goal.

Criteria for determining how transfers should be reported are documented in Lines 11-17 of the IPEDS- GRS-1(10-1-1999) instructions (page 4) as follows:

Line 11; Completers of programs of at least 2 years but less than 4 years – Report the total number of students completing these programs on **line 12**; on **lines 13 through 17**, report how long it took them to complete their program.

SPECIAL NOTE; In order to resolve a potential conflict between transfers out and the mission of particular programs to prepare students for transfer to other institutions, **institutions may count as completers** those students who have successfully completed a **transfer-preparatory program**.

Transfer-preparatory program is defined in 34 CFR Student Assistance General Provisions, Section 668.8(b)(1)(ii) as “the successful completion of at least a 2-year program that is acceptable for full credit toward a bachelor's degree and qualifies a student for admission into the third year of a bachelor's degree program.” The Secretary considers this the equivalent of an associate's degree. . .

The new rules asked for voluntary reporting until the specified “12-month period ending August 31 during which 150% of the normal time for completion ” had elapsed. Mandatory reporting was to

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begin when the Fall 1996 cohort had reached the 150% of time-to-completion. For students entering a 2+ program Fall 1996, Spring 1999 marked the magic 150% point at which a qualified program must make its initial report.¹

II. Tracking Georgia Southern University's Engineering Studies Program Transfers

Much of the information included in this paper developed from the researcher's follow-up study on leavers from Georgia Southern University's engineering transfer program. Section II of this paper, therefore, is specific to the Georgia Board of Regents' policies and Georgia Southern University's participation in a state-wide engineering transfer program. Specific practices and their results may or may not apply to other institutions in the state of Georgia or to other states' experiences.

The only higher education institutions exempt from reporting transfer-out rates are those that do not include program transfers as a part of their mission. In a paper presented before this body a year ago, Shahnam Navaee described Georgia Southern's engineering transfer program in terms that identify Georgia Southern as having an engineering transfer program as a part of its mission. Navaee's description of this program follows:

Georgia Southern University is one of eight universities in the state of Georgia which provides [sic] a wider access to engineering education through its engineering transfer program. This program is designed for students who find initial entry into the only state funded engineering school in Georgia, Georgia Institute of Technology [Georgia Tech], difficult or inconvenient. Through the Engineering Studies Program, students have an opportunity to complete their first two years of engineering education at Georgia Southern and upon successful completion of their coursework transfer to Georgia Tech. The course sequence in the Engineering Studies Program is designed with the assistance and approval of Georgia Tech to ensure that the courses are transferrable.³

¹ There is a structure in place for institutions that inadvertently fail to report. See <http://www.ed.gov/legislation/HEA/sec494.html>, where the following information outlines some of that structure, as follows:

“(b) SPECIAL ADMINISTRATIVE RULES- In carrying out paragraphs (1) and (2) of subsection (a) and any other relevant provisions of this title, the Secretary [of Education] shall--

 ` (1) establish guidelines designed to ensure uniformity of practice in the conduct of program reviews of institutions of higher education;

 ` (2) make available to each institution participating in programs authorized under this title complete copies of all review guidelines and procedures used in program reviews;

 ` (3) permit the institution to correct or cure an administrative, accounting, or record keeping error if the error is not part of a pattern of error and there is no evidence of fraud or misconduct related to the error;

 ` (4) base any civil penalty assessed against an institution of higher education resulting from a program review or audit on the gravity of the violation, failure, or misrepresentation; and

 ` (5) inform the appropriate State and accrediting agency or association whenever the Secretary takes action against an institution of higher education under this section, section 498, or section 432.'”

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Georgia Tech dominates the state's engineering degree offerings, though Mercer University (a small, private religious institution) also offers degrees in some engineering fields, and the state's only agricultural engineering program is at the University of Georgia. Georgia's engineering transfer programs have been in place since the mid-1980s. Among the state's engineering transfer programs, Georgia Southern has a reputation for providing the majority of Georgia Tech's engineering transfer students and for having the best success rate — graduation and graduating GPA — among the transfer students from across the state. Not included in Georgia Southern's high level of success in the number of its completers who graduate from Georgia Tech is the fact that some of the students who begin their engineering studies at Georgia Southern transfer to neighboring states to earn degrees at schools such as Clemson (South Carolina), Auburn (Alabama), Florida State, and The University of Tennessee.

When the current research project began, data was available only in the form of hard copy. This researcher first accessed data on students enrolled from Fall 1990 to Fall 1998 — data that had been collected and stored in databases developed within the institution. In 1998, the Board of Regents (BoR) of the University System of Georgia required most of the state's public institutions to convert to a University-System-wide data gathering and storage system. The "Banner" system was implemented more or less statewide in 1998. Institutions permitted to continue using in-house systems included Georgia Tech and the University of Georgia (UGA).

Although Banner has become an international standard and is being adopted by an increasing number of institutions, Georgia's Student Information Reporting System (SIRS) remains active and is still a repository for some types of student information. If the many Web sites dealing with Banner are any indication, a number of institutions are grappling with the issue of compatibility among multiple reporting and student identification systems. It is evidently not unusual for information maintained by multiple sources to vary widely. If the success of students who participate in transfer programs is to be documented, student data needs to be stored in a common format, using a common identification system.

Many states and school systems appear to have difficulty selecting one system as the most nearly correct from among the available information sources and relegating the remaining information as secondary or backup to the primary system.

The state of Georgia has attempted to make such a clean break, mandating use of Banner and PIDM (a personal identification numbering system). As is the case in many institutions, the change-over to Banner at Georgia Southern has made some older data difficult to access. Where those records can be recovered, the format for identification numbers and academic terms is often incompatible with the new system. To compensate, analysts and researchers have resorted to creating their own conversion tables, as shown in [Figure 3. Academic Terms and Student IDs](#). Here each student is identified by both Student ID (undisguised Social Security Numbers, used at almost every institution in the country in ways specifically prohibited by the Social Security Administration) and by PIDM.

Student tracking in Georgia was further complicated when the changeover to Banner paralleled the statewide transition from quarter to semester system. The conversion table in [Figure 3](#) illustrates parallel systems for tracking both student identification (ID [SSN] and PIDM) and academic terms (Banner Term and Quarter Term). Quarter terms were defined first by the academic year, then by the number of the term, with Summer being the first term of the following calendar year. Thus Fall 1994 is coded 952: second term of the 1994-95 academic year.

The Banner term uses a number made up of the calendar year followed by the number of the month. Although the Banner term requires more column space, it is probably more intuitive and universally useful. The table shown ([Figure 3. Academic Terms and Student IDs](#)) was produced at this researcher's request during the 2000 Christmas break, illustrating the fact that almost three years after Georgia's implementation of the Banner system, student information databases still routinely include multiple identification numbers and enrollment terms for each student.

The next level of difficulty in maintaining records on transfer students springs from the direct relationship between the transferring institution and the receiving institution. As Navaee's paper indicates, conditions for transfer of students are negotiated between the institutions.¹ To initiate that process, Georgia Southern's Engineering Studies office sends a request to the registrar's office for transcripts to be used by the receiving institution, i.e., Georgia Tech. On receipt of those transcripts, Engineering Studies sends an application to one of Georgia Tech's two campuses for each of the transferring students. (See Exhibit 1, ES Transcript Request for Transfers, and Exhibit 2, ES Transfer Requests). No structure is currently in place for the originating institution to document these students' having completed their program, but the SRK requirement that transfer-out rates be documented will necessitate creating such a structure. Georgia's Board of Regents sanctioned statewide higher education database should provide the requisite "legally-authorized statewide or regional tracking

Table : E:\...EngStudiesCompleters.DB				
	PIDM	BannerTerm	QuarterTerm	ID
1	80,708,377.00	'95203	932	259756327
2	90,314,225.00	'95301	933	552450303
3	85,304,209.00	'00303	934	258391524
4	85,305,387.00	'95303	942	259670387
5	85,303,373.00	'95403	952	257576300
6	85,306,378.00	'95403	952	387622396
7	85,302,318.00	'95403	952	255654198
8	85,305,395.00	'95303	942	286608352
9	90,320,371.00	'95403	952	257230398
10	90,310,369.00	'95403	952	255470171
11	85,305,389.00	'95403	952	260454449
12	85,303,338.00	'95403	951	257273130
13	85,301,243.00	'95303	942	252617722
14	85,302,382.00	'95303	942	254350702
15	85,305,412.00	'95403	952	260473534
16	90,316,333.00	'95403	952	587558375
17	85,305,744.00	'95203	932	261637724
18	90,315,340.00	'95303	942	372624360
19	85,304,392.00	'00303	942	250272271
20	90,317,330.00	'95403	952	409678393
21	90,315,228.00	'95303	942	253275341
22	85,300,312.00	'95303	942	011664546
23	80,312,240.00	'95403	952	527298114

Figure 3. Academic Terms and Student IDs

system.”¹ Georgia Tech has an administrator assigned to the task of tracking the success of transfer students, but to date that information has not been made available to Georgia Southern’s Office of Planning.

Some transfer program students apply to 4-year programs independently. Depending on the documentation an institution requires to indicate that a student has completed the transfer program, such a transfer may result in a drop-out report for the originating institution. This type of data loss tends to occur in one of several ways:

- B Such a student may complete transfer requirements but elect to handle the transfer personally, rather than through the structure of the originating institution. If the originating institution bases “completion” on acceptance to a 4-year program, this type of transfer would appear as a drop-out, rather than a transfer;
- B A student in a 2+ program may apply independently and be accepted into a 4-year engineering program prior to completion of the 2+ program;
- B Although Georgia Southern has a formal transfer agreement with Georgia Tech, UGA and Mercer also offer engineering degrees. A student may transfer to one of these programs and thus may appear administratively as having dropped out, rather than completing and transferring.

III. Other Shortfalls and Implications

Several other scenarios follow, in which failure to appropriately track students in an engineering transfer program produces illogical or less than totally beneficial results for the originating institution.

- B To this researcher’s knowledge, Georgia has no tracking agreement with private institutions in the state or with bordering states. DesJardins and Pontiff recommend that states where border-state migration is common negotiate tracking agreements with those states. Georgia’s engineering transfer programs are attractive to students in neighboring states for a number of reasons. Students from Florida, for instance, frequently take advantage of the opportunity to enroll a Georgia transfer program when the enrollment cap has been met in all of the state’s engineering programs. In many cases, such students are at Georgia Southern awaiting an opening in their home state’s engineering school. If transfer to an institution other than Georgia Tech is not sanctioned as completion, then under Federal guidelines that student will be identified as a transfer-out or a drop-out, irrespective of the student’s ultimate academic success. There is no logic to a system that views a student who completes Georgia Southern’s engineering studies program and goes on to earn an engineering degree in another state as an engineering drop-out.

- B In several cases, this researcher has tracked students who have left the engineering studies program in favor of even more rigorous pure science or medicine. As with students who complete other engineering programs, no reasonable person would classify these students as merely engineering drop-outs, yet they may appear as such in a simple single-institution agreement.

- B Georgia Southern has an active cooperative education program in which the engineering studies students are encouraged to participate. Like other students in professional fields, engineering students coop for work experience, to earn money for their education, or both. This researcher has found no reference to IPEDS-GRS time-to-completion accommodation for students who alternate academic terms with work experience terms.

- B The majority of students who enter Georgia Southern's engineering transfer program change majors from engineering studies early in their college career — most do so by the end of their first year. This is not a surprising result when the declared purpose in the program is access, as Navaee suggested in his statement that, "This program is designed for students who find initial entry into the only state funded engineering school in Georgia, Georgia Institute of Technology, difficult or inconvenient."³ Almost any student admitted to a college or university in Georgia may declare engineering as a major at one of the state's engineering transfer programs. For many students, this is a very optimistic undertaking. It should not be surprising, then, that many of these students have difficulty with the math requirement or the overall load that engineering students are expected to carry. If such students determine (wisely) early in their academic careers to major in fields for which they are better prepared, that decision should not carry the stigma of failure for either the students or the engineering program.

- B Student tracking beyond graduation is a standard method of validating a program's quality. An institution that provides 2+ programs but does not have a system for following students beyond its campus forfeits the privilege of taking credit for the graduate's ultimate success. The graduating institution has every reason not to facilitate alumni tracking for the originating institution. Without a fully-functional statewide and regional tracking system, the student who successfully completes a transfer program and goes on to graduate at the sister institution or another engineering school may appear merely as a successful transfer-out, while the graduate's progress after transferring could be very valuable information for marketing and development at the originating institution.

For an institution to track as successes all of its students who begin their academic careers in an engineering transfer program would require cooperation within and outside the institution. First, the institution would have to acknowledge the necessity of complying with the IPEDS-GRS Student Right to Know (SRK) reporting requirement. Then personnel responsible for such reporting would require

appropriate training. Beyond the institution, statewide and/or regional tracking capability should be accessed and reported in ways that would benefit the institution. SRK mandates that the information be released. It would behoove the institution to insure that the reported facts reflect its best qualities.

Toward that end, a structure must be set in place that will promote tracking of students between states and among state institutions, from program administration to registrar to research and planning office. At program level, every student who leaves engineering should be encouraged to make a rational decision about the subsequent major. No stable structure is smaller at its base than at its pinnacle: for every engineer to succeed in his or her chosen field, there must be several engineering technologists, and even more industrial technologists, technicians, educators and citizens with an interest in technology. We have much to gain from grooming each of our engineering leavers for successful participation in a technological society and from reporting that success to the potential student, the student's parents, and to the general public.

Exhibit 1: ES Transfer Requests

**Georgia Southern University
Intracampus Memo
School of Technology
Engineering Programs**

**P.O. Box 8047
Carruth Building**

**Telephone: 871-1010
FAX: 871-1853**

TO: Pearlle Smith, Registrar's Office
FROM: Margie Leeder
DATE: 12/18/00
SUBJECT: Transcripts

We need official transcripts for the following students who will be transferring to GA Tech:

Andrews, Damon
xxx-xx-xxxx

Farr, Joshua R.
xxx-xx-xxxx

Aybar, Christian
xxx-xx-xxxx

Cjilbert, Jason
xxx-xx-xxxx

Baggett, Jonathan
xxx-xx-xxxx

Haddock, Justin
xxx-xx-xxxx

Barr, Christopher
xxx-xx-xxxx

Hamilton, William
xxx-xx-xxxx

Belcher, Stefanie L.
xxx-xx-xxxx

Hutchins, Joshua
xxx-xx-xxxx

Bennett, Evan
xxx-xx-xxxx

Kennison, Luke
xxx-xx-xxxx

Buckthal, Craig
xxx-xx-xxxx

Moshell, John W.
xxx-xx-xxxx


Buckthal, Eric
xxx-xx-xxxx

Newell, Jamil R
xxx-xx-xxxx


Cuter, Richard Harold
xxx-xx-xxxx

Olumolade, Oluwatoyin O.
xxx-xx-xxxx


Exhibit 2: ES Transfer Requests



SCHOOL OF TECHNOLOGY
1001 STATE ROAD 101
SUNSPRING BUILDING
PO BOX 8000
SAVANNAH, GA 31404-8000
919.344.1100



SCHOOL OF INGENUITY
1001 STATE ROAD 101
SUNSPRING BUILDING
PO BOX 8000
SAVANNAH, GA 31404-8000
919.344.1100



SCHOOL OF INGENUITY
1001 STATE ROAD 101
SUNSPRING BUILDING
PO BOX 8000
SAVANNAH, GA 31404-8000
919.344.1100

September 26, 2000


Ms. Gail Haddon, Associate Director of Admissions
Admissions Office
GA Tech
Atlanta, GA 30332
Dear Ms. Haddon:

Please, you will find an undergraduate application form for the Southern University Transfer Program for Spring Semester 2001 for the following students:


James T. Sterling
Lettie M. Sparks

Sincerely,
Gerard A. Jones, Ph.D.
Gerard A. Jones, Ph.D.
Director, Engineering Programs


GHA:gm
encl.



SCHOOL OF TECHNOLOGY
1001 STATE ROAD 101
SUNSPRING BUILDING
PO BOX 8000
SAVANNAH, GA 31404-8000
919.344.1100



SCHOOL OF INGENUITY
1001 STATE ROAD 101
SUNSPRING BUILDING
PO BOX 8000
SAVANNAH, GA 31404-8000
919.344.1100



SCHOOL OF INGENUITY
1001 STATE ROAD 101
SUNSPRING BUILDING
PO BOX 8000
SAVANNAH, GA 31404-8000
919.344.1100

October 5, 2000

Ms. Jill Parks
305 MLK Blvd.
Suite 226
Savannah, GA 31401
Dear Ms. Parks:

I received your email re undergraduate application from Georgia Southern University for admission to GA Tech (Georgia Southern campus) thru the STRIP for Spring Semester 2001 for the following students:

James T. Sterling
Lettie M. Sparks

Sincerely,
Gerard A. Jones, Ph.D.
Gerard A. Jones, Ph.D.
Director, Engineering Programs

GHA:gm
encl.

Bibliography

1. DesJardins, S. L. and Pontiff. H. *Tracking Institutional Leavers: An Application*, University of Minnesota.(1999).
2. Federal Register. 1998 Amendments to Higher Education Act of 1965 (1999).
3. Navaee, S. "Computer Utilization in Enhancing Engineering Education". ASEE National Conference, 2000, St. Louis, MO, American Society for Engineering Education.(2000).

CAROLINE HEMBEL BEARD

Caroline Hembel Beard is currently Assistant Professor of Technology at Georgia Southern University in Statesboro, Georgia, and a doctoral candidate in Higher Education at The University of Georgia. She received her Bachelor of Engineering Technology and Master of Technology degrees from Georgia Southern University. Before becoming a faculty member, she worked as a project engineer in heavy industry and in physical plant at Georgia Southern. Her doctoral research is in the area of women and minorities who leave engineering as a college major.