UNDERGRADUATE PORTFOLIOS IN INDUSTRIAL ENGINEERING AT NORTH CAROLINA A&T STATE UNIVERSITY

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ABSTRACT

This paper addresses the following issues: an implementation model for undergraduate portfolios, a survey of other internal assessment tools, and the success of the implementation.

In the Spring semester of 1997, the Department of Industrial Engineering at North Carolina A&T State University decided that a portfolio program for its undergraduates would be a useful assessment tool for the future evaluations of its BSIE program under the ABET-2000 accreditation criteria. Dr. Ram sought and received sponsorship from the NSF-SUCCEED coalition for reviewing the existing models for such portfolios and for developing an implementation method in the context of the BSIE program at North Carolina A&T State University. The implementation of the approach began with the Fall 1997 freshman class.

The SUCCEED coalition also requested that a literature survey of other internal assessment tools be completed to support the efforts of the Outcomes Assessment team of the SUCCEED coalition. This survey is presented in a separate chapter.

1.0 INTRODUCTION

In preparation for the new criteria under ABET 2000, procedures must be in place for campus assessment of undergraduate students. Undergraduate portfolios were used as a means of outcomes assessment for the Department of Industrial Engineering at North Carolina A&T State University. Portfolios were designed to give a brief overview of undergraduate educational experiences and to demonstrate significant areas of learning and professional competence. The freshman class entering in the Fall of 1997 were the first class to be evaluated under the new ABET 2000 criteria.

1.1 Purpose and Objective

The purpose of this project was to develop a format and implementation scheme for undergraduate portfolios in the Department of Industrial Engineering at North Carolina A&T State University. The overall objective of this project was to develop a means of outcomes assessment that would enhance student performance and satisfy the requirements set forth by ABET 2000.

1.2 Scope

This project was limited to the outcomes assessment process for the Department of Industrial Engineering at North Carolina A&T State University. However, the results of this study could be used as a guideline for other educational organizations that may be interested in outcomes assessment.

2.0 METHODOLOGY

The methodology for developing undergraduate portfolios for the Department of Industrial Engineering consisted of the following steps:

1) Planning the study:
   This step involved defining all activities needed to meet the objectives of the project.

2)   Surveying Current Practices in Undergraduate Portfolios:
This step involved reviewing any formalized documentation relevant to the development of undergraduate portfolios. Portfolio practices used internally at other colleges and universities were also explored. The information gathered was used for benchmarking purposes.

3)   Developing a Portfolio Format:
The portfolio was developed based on the goals set forth in the 1995-97 Bulletin of North Carolina A&T State University and the ABET 2000 Criteria. Developing the portfolio format involved determining the sections to be included in the portfolio, a brief description of each section, examples of items to be included in the portfolio, as well as a listing of sources where students could gather information.

4)   Developing a Mechanism for Updating and Maintaining Portfolios:
Once a format was determined, a method was developed to update and maintain undergraduate portfolios. This step involved determining the roles and responsibilities of students, faculty, and staff. These roles and responsibilities were defined in such a way that they would yield the most efficient and effective method of portfolio upkeep.

3.0   DEVELOPING UNDERGRADUATE PORTFOLIOS

3.1   The Portfolio Format

The format for undergraduate portfolios was developed based on the goals set forth in the 1995-97 Bulletin of North Carolina A&T State University , the objectives of the Department of Industrial Engineering, and the ABET 2000 Criteria. The portfolio consisted of a three ring binder with dividers for the following sections:

- Leadership Skills
- Oral Communication Skills
- Written Communication Skills
- Technical Competence
- Critical Thinking
- Teamwork Skills
- Social Consciousness
- Global Context of Engineering
- Lifelong Learning
- Professional and Ethical Responsibility
- Interpersonal Skills
- Career Readiness

This portfolio format allowed the Department of Industrial Engineering to meet the criteria set forth by ABET 2000 as well as the goals set forth by the University. Development of undergraduate portfolios also gave students the opportunity to monitor their academic and professional careers from a holistic point of view. Table 1: (Portfolio Guidelines), lists the names of the sections to be included in the portfolio, a brief description of each section, examples of items to be included in each section, and sources where students could gather information. This table was used by students as a guideline for portfolio compilation.

3.2   *Maintaining and Updating Portfolios*

Upon completion of the portfolio format a method of maintaining undergraduate portfolios was developed. This method defined the roles and responsibilities of the faculty, staff, and students, in maintaining the portfolio. The following describes the steps that were taken to maintain undergraduate portfolios, for the Department of the Industrial Engineering, at North Carolina A&T State University.

Section Name	Description	Examples of Items to Be Included
Leadership Skills	information or documentation that demonstrates the students leadership abilities.	letters from organizations, leadership skills forms, letters from part-time jobs/internships/coops
Oral Communication Skills	documentation that demonstrates the student's ability to orally express themselves.	presentation skills forms
Written Communication Skills	samples of written work that demonstrates the student's ability to express themselves in a written form.	research papers, documented projects
Technical Competence	documentation that demonstrates the student's ability to understand the technical concepts and ideas of industrial engineering.	current transcript
Critical Thinking	documentation that demonstrates the student's ability to generate new ideas and to think for themselves.	design projects
Teamwork Skills	documentation that demonstrates the student's ability to work efficiently and effectively in ateam environment.	team evaluation forms
Social Consciousness	documentation that demonstrates that students are mindful of the socio economic status of others.	list of community service activities, letters from community service organizations
Global Context of Engineering	documentation that demonstrates the student's understanding of the impact of engineering in a global/societal context.	study of industrial engineering in other countries, list of relevant seminars and articles
Lifelong Learning	documentation that	list of seminars, conferences,

	demonstrates avenues by which the student continuously enhances skills, knowledge and awareness of what is going on around them.	and workshops attended, watching the news, reading the newspaper, reading magazines
Professional and Ethical Responsibility	documentation that demonstrates the student's understanding of the moral issues associated with his/her profession..	tests from class, list relevant seminars, articles, workshops, and presentations
Interpersonal Skills	documentation that demonstrates the student's ability to communicate and interact with people on a professional and personal level..	interpersonal skills form
Career Readiness	documentation. of the steps taken by the student, that demonstrate his/her ability to excel in a professional career upon completeion of the undergraduate program..	updated resume, internship/coop evaluation forms, list of memberships in student professional organizations, mentoring

NOTE: Some sources may not be applicable and students are not limited to the sources listed above.

Table 1. Portfolio Guidelines

3.2.1   Departmental Guidelines

- <u>Undergraduate Portfolio Orientation:</u> Each semester all freshman and transfer students were required to attend a mandatory undergraduate portfolio orientation.   Orientation was conducted by a selected faculty member(s) of the Industrial Engineering Department. This orientation provided students with the opportunity to get an understanding of what is to be contained in the portfolio as well as how the portfolio was maintained from semester to semester. Students were also given reference materials to use as guidelines when developing portfolios.   Students who were unable to attend the meeting were able to get portfolio guidelines from his/her advisor.
- <u>Storage and Upkeep of Undergraduate Portfolios:</u> Portfolios are stored in the Industrial Engineering Department. Students were required to set appointments with the department secretary to insert materials into his/her portfolio. All materials were to be inserted prior to the beginning of the registration period. Each semester, during registration students will review the portfolio with his/ her advisor to ensure that he/ she is on the right track. Once the review is completed the student and the advisor will sign and date the Student/Advisor Review Form.   Students will not be allowed to register for classes unless they have completed and reviewed the portfolio with their advisor for the given semester.   Thus advisors should not sign off on registration forms unless he/she has reviewed the portfolio

with the student. The process will continue throughout the students tenure in the Industrial Engineering Department, unless otherwise specified.

- Graduation Requirement: It is pertinent for the student to recognize the importance of undergraduate portfolio development. To stress the importance of undergraduate portfolios students may not be allowed to graduate unless they have maintained an undergraduate portfolio throughout their stay in the Industrial Engineering Department. This process will be monitored through INEN 495: Design Projects in Industrial Engineering. Portfolios will count for a significant portion of the students grade in this final senior design class. Those students who have not maintained portfolios will see a significant negative effect on his/her final grade in class. This may in turn effect the students graduation.

- Forms: There were several forms that are to be completed either in the classroom or by outside sources. These forms include Internship/Coop Evaluation Forms (to be completed by an outside source), Interpersonal Skills Evaluation Forms (may be completed in the classroom or by an outside source), Leadership Skills Evaluation Forms (may be completed in the classroom or by an outside source), Team Evaluation Forms (may be completed in the classroom or by an outside source), and Presentation Skills Evaluation Forms (may be completed in the classroom or by an outside source). Those forms that are to be completed in the classroom will be completed by students who are working together in a team oriented class project, with the exception of the Presentation Skills Form which does not necessarily require the student to work with others. Professors will provide students with a final average tally, at the end of a given course. The forms with the final average tallies will be included in the portfolio. It will be left to the discretion of the professor as to how evaluation tallies will be maintained throughout the semester. It is recommended that these forms be listed, in association with the classes students will be required to take, in the IE Curriculum.

3.2.2   Student Guidelines

- Gathering Information: Each semester students will be required to gather a limited amount of information to insert into undergraduate portfolios. It is important for the student to keep in mind that a portfolio is a compilation of his/her "best" work. This implies that the student should be careful in choosing what he/she will insert in the portfolio. Students are not expected to insert something into each section of the portfolio every semester. However, they are expected to make the portfolio as complete as possible from semester to semester. Students will have an abundance of some items (tests, research papers, documented projects, forms, etc.) to insert each semester. No more than two of these items should be inserted into each section of the portfolio during any given semester.

- Completing Forms: Several forms will be completed and inserted into the portfolio. Some forms may be completed in the classroom while others may be completed by outside sources. These forms include Internship/Coop Evaluation Forms (to be completed by an outside source), Interpersonal Skills Evaluation Forms (may be completed in the classroom or by an outside source), Leadership Skills Evaluation Forms (may be completed in the classroom or by an outside source), Team Evaluation Forms (may be completed in the classroom or by an outside source), and Presentation Skills Evaluation Forms (may be completed in the classroom or by an outside source). Forms completed in the classroom may be completed by students with whom you have worked with in a team environment, with the exception of the

presentation skills form which does not necessarily require the student to have worked on a team. When completed in the classroom, forms will be provided by the professor. Some forms may also be completed by outside sources. These outside sources may include someone with whom you've worked with on an internship, coop, part-time job, or volunteer service organization. Copies of forms that are completed by outside sources can be gathered from the student's academic advisor. It is recommended that these forms be listed, in association with the classes students will be required to take, in the Industrial Engineering.

- Updating the Portfolio: Items that are inserted into the portfolio will remain there throughout the students tenure in the Department of Industrial Engineering. Some items such as resumes and lists are to be replaced as they are updated from semester to semester. Undergraduate portfolios are stored within the Department of Industrial Engineering. All new materials are placed in the portfolio prior to registration. Students are required to set up appointments with the department secretary to insert materials into the portfolio. Those students who have not updated their portfolios will not be allowed to register for classes.

- Reviewing the Portfolio: Each semester during the registration period students are required to review the portfolio with his/her advisor to ensure that he/she is on the right track. Once the review is complete the student and the advisor will sign and date the Student /Advisor Portfolio Review Form . Students will not be allowed to register until this step is completed.

- Graduation Requirement: It is pertinent for students to understand the importance of undergraduate portfolio development. Those students who do not maintain undergraduate portfolios throughout their stay in the Department of Industrial Engineering will not be allowed to graduate. The portfolio will count for a significant portion of the student's grade in the final senior design class, Design Projects in Industrial Engineering (INEN 495). Those students who have not maintained portfolios from semester to semester will see a significant negative effect on his/her grade in this final design class. This may in turn effect the students graduation.

This method of maintaining will allow for efficient and effective upkeep of undergraduate portfolios. It defines the responsibilities of the students, faculty, and staff, relative to portfolio maintenance. It is important for all involved to be aware of and follow through with their responsibilities, otherwise the process will not be successful.

4.0   PORTFOLIO IMPLEMENTATION

4.1   Student Contact Problems

Contacting students to discuss portfolio information was a major problem. It was very difficult for the graduate students assigned to work on the portfolio project to contact students by phone because either they were not available or the contact number was not available. If leaving a message was possible, calls were rarely returned. If contact was made with students, meeting times were made but not always kept. This made it difficulty to meet with students to properly discuss their portfolios.

Getting all the freshman students to participate when meetings were held was another problem. The few students who did show up to meetings were the ones who were already aware of the portfolio. Due to the lack of participation, sometimes portfolio meetings were canceled,

which in turn wasted both the students and advisors time. Trying to contact students before and after classes at their perspective classrooms was another method used to inform students of the portfolio and of meetings. Graduate students working on the portfolio/advisors had a greater success at making contact with students after repeatedly going to their classes than by phone, mail, flyers or word of mouth.

4.2 Portfolio Successes

Even with the problems encountered with the portfolio, it has been a successful endeavor. An example portfolio was created to show students what should be included in theirs. Students who were able to meet with their freshman advisors and graduate students advisors were shown how to build their portfolios correctly. The building of each student's portfolio was monitored on a regular basis by both the freshman advisors and the graduate students advisors. Students were required to bring all graded papers (tests, quizzes, design projects, homework and writing assignments, and research papers) to portfolio meetings and to meetings with the freshman advisors and graduate student advisors.

4.3 Incentives Developed to Improve Portfolio Participation

Incentives may be one way to encourage students to participate in building portfolios. As mentioned earlier, grades for the portfolio will be disseminated in some industrial engineering classes. However, most of our students do not begin taking IE classes until their sophomore year. Therefore, we have to motivate them during their freshman year to participate in the portfolio effort. One additional incentive we used money. One hundred dollars was given to the student who had the best quality portfolio for the fall semester. The freshman advisors and student advisors were the judges. Portfolios were evaluated for neatness and for content.

5.0 CONCLUSIONS

The purpose of this project was to develop a format and implementation scheme, for undergraduate portfolios, in the Department of Industrial Engineering. The portfolio format and the guidelines developed for maintaining undergraduate portfolios were developed in such a way that they will provide the most efficient and effective means of measuring outcomes assessment. The results of this project may be used to enhance student performance and to satisfy the requirements set forth by ABET 2000 and the Department of Industrial Engineering.

6.0 REFERENCES

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