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ABSTRACT

WRITING ACROSS THE CURRICULUM AT TECHNOLOGICAL UNIVERSITIES – A CASE STUDY

by
Deborah A. Hulse-Miksiewicz

Writing across the Curriculum (WAC) initiatives have begun to embrace multiple resources to aid in the evolution of writing and technology. WAC initiatives enhance the teaching of writing across the disciplines by incorporating the writing instruction directly into the discipline courses, in addition to providing guidance designed to complement the instruction provided in the technical classroom. This thesis will explore the WAC initiative, discuss why this initiative is important, and examine case studies of successful implementations in technological universities.

ONLINE RESOURCES FOR TECHNICAL COMMUNICATION IN WRITING ACROSS THE CURRICULUM AT TECHNOLOGICAL UNIVERSITIES – A CASE STUDY

by
Deborah A. Hulse-Miksiewicz

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APPROVAL PAGE

**ONLINE RESOURCES FOR TECHNICAL COMMUNICATION IN WRITING
ACROSS THE CURRICULUM AT TECHNOLOGICAL UNIVERSITIES
– A CASE STUDY**

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In memory of Caroline D. Zimmerman

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INTRODUCTION

1.1 Objective

Writing Across the Curriculum (WAC) initiatives have begun to embrace multiple resources to aid in the evolution of writing and technology. WAC initiatives enhance the teaching of writing across the disciplines by providing guidance designed to complement the instruction provided in the technical classroom. This paper explores the WAC initiative, discusses why this initiative is important, and examines case studies of successful implementations within technological universities to identify the key factors of successful WAC initiatives.

1.2 Problem Statement

Technological Universities, like the New Jersey Institute of Technology (NJIT), wishing to create or continue WAC programs face challenges from a number of directions. Typical start up challenges include communicating the importance of these programs to the administration, obtaining funding and resources, and persuading the faculty to embrace a WAC program.

Integration of WAC into the curriculum presents the challenge of redesigning courses to allow for the incorporation of discipline specific writing tasks. This challenge is made easier by the willingness — or more difficult by the lack thereof — of both faculty and students to embrace this pedagogical model. Strong administrative support can be a key factor, as an overarching monitor, by

requiring the consistent implementation of these educational initiatives across all of the disciplines within a university curriculum.

Technological communications instruction must keep pace with the ongoing evolution of multimedia technologies if students are to remain competitive in the market. Methodologies must be determined to demonstrate the value of integrating WAC into the technological curriculums, to ensure the ongoing growth of faculty and students, and to realize the benefits of these campus wide pedagogical policies.

CHAPTER 2

LITERATURE REVIEW

2.1 Writing Across the Curriculum Defined

Writing Across the Curriculum is a pedagogical movement that gained momentum in the early 1980's. However, the program dates as far back as 1969 when Barbara Walwoord led the first WAC faculty seminar at Central College in Pella, Iowa. This seminar led to the establishment of a writing proficiency requirement for all undergraduate majors at the four-year liberal arts college. Carleton College, in Minnesota also began to explore the writing across the curriculum pedagogy at that time. Later, Beaver College and Michigan Technological University joined the movement and added the key elements of writing intensive course requirements, faculty training, and peer tutoring (Bazerman, et al., 2005, p. 26). The first meeting to organize what was later to become the "WAC Network" occurred in 1979 at the Annual Convention of the Nation Council of Teachers of English (Thaiss   Porter, 2010).

Over time, the concept of incorporating good writing techniques into the documents of each writing discipline has become more popular among universities looking to produce graduates with superior writing and presentation skills who would be valued additions to the workforce. "The National Science Foundation (NSF) has long recognized the importance of communication education in the sciences and has encouraged change in the way that student scientists are educated" (Mya, Lerner,   Craig, 2010).

While Writing In the Disciplines (WID) and Writing Across the Curriculum (WAC) are often used interchangeably, there are important differences that should be noted. Here is how The WAC Clearinghouse (The WAC Clearinghouse, 2013) defines these basic principles:

- that writing is the responsibility of the entire academic community
- that writing must be integrated across departmental boundaries
- that writing instruction must be continuous during all four years of undergraduate education
- that writing promotes learning
- that only by practicing the conventions of an academic discipline will students begin to communicate effectively within that discipline

WAC describes the whole of the teaching process involved in ensuring that students can write effectively for a number of audiences, within a particular discipline or outside of it. As WAC includes the components of WID, this will be the terminology adopted for this paper.

WID is a subset of WAC, and refers to the ability to write within a particular discipline, including learning to use the discipline's specific terminology. "Writing assignments of this sort are designed to introduce or give students practice with the language conventions of a discipline as well as with specific formats typical of a given discipline" (The WAC Clearinghouse, 2013).

Simply having a writing assignment added to a technical course is not the purpose of a WAC program, and neither is teaching grammar in technical courses. "…it is worth reemphasizing the basic assumptions of WAC: that writing and thinking are closely allied, that learning to write well involves learning particular discourse conventions, and that, therefore, writing belongs in the entire curriculum, not just in a course offered by the English department" (McLeod

Soven, 1992). The purpose then, of WAC, is to train the students how to use writing to communicate discipline specific concepts to wider audiences.

Accrediting agencies, such as ABET (Accreditation Board for Engineering and Technology) (ABET, 2013) have recognized the importance of WAC by providing written discipline specific communications requirements in the accreditation requirements, which include:

- an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;

- an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;

- an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;

- an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;

- an ability to function effectively as a member or leader on a technical team;

- an ability to identify, analyze, and solve broadly-defined engineering technology problems;

- an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;

A more recent innovation in WAC that takes into account communications technology in addition to writing skills is "Communicating across the Curriculum, or CxC" which includes all of the aspects of WID WAC in addition to presentation

skills involving media, graphics, and oral presentations (Bazerman, et al., 2005). "Communication is a large part of the engineering profession, and the future success of students depends on whether they can work with knowledge transfer and knowledge generation. The methods by which engineers communicate are also changing: in addition to using written language, students need to learn electronic and visual methods of communication" (Johnson C. S., 2006).

2.2 WAC in Engineering and Technology Universities

Engineering and technology are disciplines where precise technical communications are essential. These include both the writing and the diagrams used. The information conveyed must be clear to both technical and non-technical audiences. The need to convey complex technical concepts in addition to clear writing is a key requirement for employers who need to use remotely located, often offshore, resources to do the work. Documentation must be clear, accurate, and include properly annotated schematics, drawings, or graphical depictions of complex technical constructs.

"For professional scientists and engineers, communication skills include a wide range of abilities, including knowing when and what types of communications to use, how to use evidence that is recognizable and understandable to the audience, and how to deploy the communication in ways that appeal to a group's sense of itself, and how to work collaboratively to achieve those ends" (Mya, Lerner, Craig, 2010).

2.3 The Importance of WAC to Students

The ability to write well is a learned skill. Over time and with the right guidance, students learn how to do good research, and how to combine the findings into a pattern of questions and answers, culminating in a work that is more than the sum of its parts. Key to this transformation is the ability to transform relevant bits of data into useful information and to present that information in a manner suited for its intended audience. Students who learn to write well are better thinkers, and gain the ability to pose worthwhile questions. In addition to all of this, the most important question is "What activities encourage student to work and to think like professional engineers?" (Mya, Lerner, Craig, 2010).

Each discipline has its own series of communication standards and protocols that a student is required to master for each specific genre, and there are two distinct skill sets involved in this process. The first is for the student to demonstrate the ability to communicate using specific language germane to that discipline, to show that the student has learned the knowledge of that discipline. The second is for the student to demonstrate the ability to communicate that knowledge to a wide range of consumers external to that particular discipline. As students learn their discipline, they must also learn the proper communication skills for a particular genre, so that they are able to be effective communicators across multiple communications or media types. Over time, the addition of new technologies has further complicated this task, as students must also learn new programs and new communications methodologies. The use of technology

should enhance the writing process, without overwhelming the student or the reader with unnecessary complexity.

Learning to write is a process that involves not just learning the mechanics of grammar and sentence structure, but being able to choose the right words. It is having the ability to put ones thoughts in an order that is meaningful. Once that is accomplished, the meaning behind the writing and the message being communicated becomes the next milestone. There are two phases of the learning process, according to Art Young, one of the initial leaders in the field of WAC. These are writing-to-learn and writing-to-communicate. Simply put, writing-to-learn creates the opportunity for the student to 'explain things to oneself', while writing-to-communicate creates the opportunity for the student to 'explain things to others' (Young, 2006).

"Writing to communicate…means writing to accomplish something, to inform, instruct, or persuade…Writing to learn is different. We write to ourselves as well as talk with others to objectify our perceptions of reality; the primary function of this "expressive" language is not to communicate, but to order and represent experience to our own understanding. In this sense language provides us with a unique way of knowing and becomes a tool for discovering, for shaping meaning, and for reaching understanding" (Fulwiler   Young, 1990).

"The promulgation and practice of writing-to-learn throughout the curriculum is one of the major contributions of the WAC movement". Young maintains that these types of assignments allow the student to explore a topic, and 'explain it to oneself' and thereby better understand it before trying to explain

it to someone else. The writing-to-communicate assignment challenges the student to "explain the matter to others" and so therefore the "WAC movement encourages adding writing to learn to most courses for two principle purposes: (1) students will learn the material better and (2) this better understanding will lead to improved written communication" (Young, 2006, p. 9).

2.4 The Importance of WAC to Pedagogy

"Writing is the vehicle that programs embrace as the means for reviewing how well students are able to assimilate knowledge and integrate that knowledge into new ideas" (Ondrusek, 2012).

This type of evolutionary thinking is a key goal to demonstrating that the learning has been effective, and a key to fostering this behavior is the availability of a variety of resources where students can go to improve their communications skills. "At the universities where engineering-based communication and writing centers have been established, interactions among tutors and students as well as tutors and engineering faculty have proved beneficial to all" (Ford   Riley, 2003).

Assessment at technological universities is based on a writing communications portfolio guided by criteria from ABET, Accreditation Board of Engineering Technology. ABET provides guidelines for engineering programs that includes, among others "an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature" (ABET, 2013). These are the

skills specific to communicating across the disciplines — skills which are recognized as being necessary to be a professional within a discipline. "ABET is an organization that monitors, evaluates, and certifies engineering and related education programs in the U.S. to ensure that graduates are ready for the practice of engineering at a professional level" (Coppola N. W., 1999).

2.5 The Importance of WAC to Employers

In every career, there is some form of writing, be it in the creation of technical specifications, instructional documents, and reports, formal presentations to upper management and informal emails to coworkers or clients. In the technology field, the ability to provide complex concepts in various formats to disparate audiences is highly valued because there are a wide variety of communications needs in technology. Clear communications is essential in being able to work in teams, and especially across multicultural and or multinational corporations.

Technical communication by its very nature requires the ability to understand the audience, how the information will be used, and the level of technical or nonprofessional knowledge required to make that communication successful. "Writing … is not simply marginal to disciplines, merely an epiphenomenon on the boundaries of academic practice. On the contrary it helps to create those disciplines by influencing how members relate to one another, and by determining who will be regarded as members, who will gain success and what will count as knowledge" (Hyland, 2004).

2.6 How Should Universities Implement WAC?

While the exact implementation across universities may vary, one commonality is the providing of resources for both students and faculty to complement classroom activities. These resources address specific writing issues; provide sample papers, sample curriculums, or advanced skills development. Some universities provide a writing center on campus, or an online experience with information customized by that institution, while others prefer to link to resources provided by established sources — such as the OWL Purdue Online Writing Lab. The diversity of the curriculum at the university is one reason for this. "No writing center or WAC program can be simply lifted from one institution and used successfully in another; it must be adjusted to each school's objectives and demographics. Outside consultants can assure faculty that a writing center gathers writing assignments from students across the disciplines without adding to the faculty's workload" (Mulin   Farrell-Childers, 1995)

The majority of this research shows that most technology universities choose to incorporate WAC initiatives directly into the curriculum rather than separate the learning of writing from the learning of the discipline. They recognize that students learn best when given the opportunity to practice writing within their chosen discipline. A 2012 survey published in the Journal of Engineering Education asked the question "Which ABET competencies do engineering graduates find most important in their work?" The data shows that "… creating curricula that help students develop and integrate the technical and

professional competencies will require that we embed the content in the context of professional practice. Accomplishing this will require design, a competency that many engineering faculty have in abundance" (Passow, 2012).

Additional research into the best practices of other technological universities shows slightly different methods of managing the balance between writing and discipline specific curriculum. In many programs, additional advanced writing instruction is included as part of the discipline specific course. These courses are writing intensive, with writing tasks specifically targeted towards the requirements of that discipline. In other programs, writing labs and online resources supplement these courses with information on writing which will not fit into the curriculum. Additional resources on how to use common technological tools of the discipline are made available to assist students with learning the tools and best practices of communications.

2.7 Educational Resources and WAC

A study of the symbiotic relationship between WAC and Writing centers by the WAC Mapping Project shows that as of 2010, 70   of all reported WAC programs include participation by the writing centers (Thaiss   Porter, 2010). The use of the term writing center is broadly defined but for the terms of this study refer to any resource external to the actual course curriculum that is made available to the student for the purposes of learning writing techniques.

Practice has borne out that it is important to have resources such as librarians to assist students with research topics and verification of research

results and dedicated resources aimed at teaching proper composition and grammar. In an educational environment where both peers and faculty can provide feedback to the student, and they can receive mentoring from other senior students within that same discipline, positive results have been reported (Ford   Riley, 2003).

This is notably true in technical writing scenarios where peer review helps students create better communications and clarify their ideas. "Peers might then learn from each other as ideas are being communicated. Interaction among peer members encourage clarification of content as well as problems chosen" (Ediger, 2012).

One educational challenge is that the faculty assumes the students have already learned to write properly because the essential English and math skills are acceptance requirements for upper level college programs. These students are often required to take additional writing classes in their first year at the institution. With this expectation in mind, the typical discipline specific faculty member focuses assignments on the course content instead of the student delivering a complete and cohesive paper. "In other words, faculty members seem to expect students to complete the writing process independently because they believe a need exists to spend more time teaching course content than writing. They are unable to discuss writing in the vernacular, or they expect their students to possess writing skills, which is consistent with the literature" (Plutsky   Wilson, 2001).

WAC programs that coordinate with writing centers or writing labs benefit faculty in assisting with both the delivery of the instructional materials but also in having the labs capturing evidence of student progress. "In the writing center, the director and tutors see syllabi and writing assignments — from those that are questionable to those of high quality — from across the disciplines; they see faculty comments — or the lack thereof — on papers; they hear students' interpretations of classroom environments and teaching practices; and they collaborate with teachers on ways to improve student learning through writing " (Mulin   Farrell-Childers, 1995).

2.8 Challenges in Implementing WAC Programs

There are a number of different types of challenges to implementing WAC programs, and these need to be actively monitored and addressed. Co-editors Fulwiler and Young identified what they termed the 'six enemies of WAC' which included uncertain leadership (from both professors and university administration), English department orthodoxy, compartmentalized academic administration,   academe's traditional reward system which does not value teaching, testing and quantification and entrenched attitudes" (Fulwiler   Young, 1990, p. 287).

Administrations will ask for statistics that report the program has been successful and is growing, or not. They will require concrete evidence that these programs are effective. Expansions or requests for additional staffing will require

justifications which will invariably be based upon what is considered the 'value add' of the center to the university.

Faculty is often resistant to WAC programs. An English professor may not feel comfortable grading the technical aspects of a paper, and the technical professor may be similarly uncomfortable with grading the grammar. "Quite reasonably, these faculty worry that since they lack competence as writing critics, they will not be effective in helping students improve their writing" (Harris Schaible, 1997). This is a sentiment repeated by a number of teaching professionals who wish to concentrate on the subject matter instead of teaching the student how to write. Plutsky (2001) notes that, "Faculty perceive themselves to be ineffective teachers of writing. Generally, they expressed discomfort employing teaching methods for writing."

However, perhaps the biggest challenge to adopting a comprehensive writing initiative is the workload on both the students and the faculty. "The overwhelming weight of current evidence suggests that WAC can improve both student comprehension of subject-specific knowledge, and their writing, but only when it is consistently and rigorously applied" (Harris   Schaible, 1997).

Professors tasked with teaching a greater number of students than ever in addition to the demands of keeping up with the rapidly changing world of technology are already overloaded. The extra time required to guide each student in the nuances of writing across the curriculum is often not available. The additional requirement of requiring ongoing faculty to train in and maintain

certifications in WAC programs, while valuable and necessary nevertheless represent an additional drain on already strained resources.

2.9 WAC Program Evaluation Obstacles

One of the biggest challenges to garnering support for implementing a WAC program is the inability to measure the effectiveness of the programs. This does not mean that they are ineffective, it is certain that they are or else the programs would not be proliferating across the colleges. Measurement is difficult due to the wide range of variables that make up a learning experience. Did the student improve because the teaching materials were effective, the teacher was effective, the material was interesting, or due to some external factor? Building a model is difficult with so many variables. Toby Fulwiler (1988) recognized this as an issue and created an itemized list of the seven obstacles to evaluating WAC programs:

1. The definition of 'writing across the disciplines' has multiple meanings depending on which person or institution you are referencing.

2. Writing across the curriculum programs are result orientated, and the people who run them are the same. The qualitative and anecdotal nature of the data collected in these programs over time does not translate well into clear statistical statements that are useful as proof of effectiveness to funding committees.

3. WAC programs evolve. They grow and mutate into what works for a particular university, and what they become is rarely the same as what they started with, so there are no baselines for measurement.

4. Program variations across institutions make comparing them difficult. WAC Programs can be managed by different departments, such as the English department, some dedicated interdisciplinary faculty, writing centers, or some combination thereof.

5. Quantitative measures of either writing or learning ability are difficult to achieve and marginally useful. The root cause of the improvement (or lack thereof) is nearly impossible to attribute to the WAC program.

6. Writing across the curriculum programs is amorphous and open-ended. There is no way to identify exactly which students are having difficulty and in which area, and then what resource provided solved that problem for that student. With multiple combinations of students and learning issues, creating usable statistics becomes difficult.

7. Successful writing across the curriculum programs runs deep into the center of the curriculum. Because WAC programs touch most of the courses in a student's curriculum over a period of several years, it becomes as difficult to prove the student is fully educated as it is to prove that the WAC program works.

This is not to say that there is no way to measure the impact a WAC program has on the university, but only that measurement needs to be carefully planned and executed in such a way as to isolate the data from external influences. A WAC program contains diverse elements, making measurement difficult — but not impossible. Consistent evaluation can be a challenge due to the number of variables. Inconsistent evaluation techniques and variability in measurement introduced during the review process can invalidate the results and result in inconsistent grading practices. It can also lead to bad data, which could result in budget cuts.

CHAPTER 3

METHODOLOGY – **A CASE STUDY**

The design of this case study allowed for the development of an in-depth understanding of how three large technological universities similar to NJIT have successfully embraced and integrated the concepts of WAC within their curriculum. The literature review provides us with the background of WAC concepts, and the research into a number of similar universities formed the framework for this case study.

The universities chosen for this study have the following characteristics and the following criteria were examined:

- They are large technological universities in the U.S.

- A strong commitment to incorporating WAC directly into the curriculum — In each case the level of commitment the university has committed towards their WAC programs was examined;

- The methods by which each delivered these programs;

- The commitment to the WAC program and other support services;

- The commitment to support faculty initiatives.

Using resources from the university websites, publications, peer reviewed journals, the WAC Clearinghouse, and a national study on WAC, this case study examines how three technological universities, the University of Wisconsin, The University of Texas at Austin, and MIT, the Massachusetts Institute of Technology, address these issues of WAC implementation and ongoing

continuous improvement. What can they tell us about a how to implement a successful WAC program?

3.1 University of Wisconsin-Madison

3.1.1 Overview

The University of Wisconsin-Madison is a large public research university opened in 1848 and located in Madison, Wisconsin. Today, the university serves approximately 42,500 students with a staff of over 2,000 faculty (University of Wisconsin-Madison, 2013). UW-Madison currently has approximately 4000 international students representing 110 countries, and provides classes in 80 languages.

The WAC program is part of the English Department, which also provides the UW Writing Center, Writing Fellows, and a Design Lab to help faculty integrate writing and presentation skills into the curriculum. Forbes ranks UW-Madison at 147, while US News   Report gives a ranking of 41 (Forbes, 2013) (U.S.News, 2013). ABET accreditation was first obtained in 1936 and they currently hold accreditation for 38 individual programs (ABET, 2013).

3.1.2 University Commitment to the Program

Brad Hughes, the UW-Madison WAC Program Director (Huges, 2013) is a strong supporter of the WAC movement, and provides a number of reasons to the faculty of UW-Madison on why they should build writing assignments directly into the coursework. Among these are:

- Writing deepens thinking and increases students' engagement with course material. Good writing assignments prompt students to think more deeply about what they are learning.

- Research done by Richard Light at Harvard confirms that "students relate writing to intensity of courses. The relationship between the amount of writing for a course and students' level of engagement--whether engagement is measured by time spent on the course, or the intellectual challenge it presents, or students' self-reported level of interest in it--is stronger than any relationship we found between student engagement and any other course characteristic" (The Harvard Assessment Seminars, Second Report, 1992, 25; Making the Most of College: Students Speak Their Minds [Cambridge, MA: Harvard UP, 2001], 64).

- Writing can improve our relationship with our students. When students write papers, we get to know them and their thinking better; they are more likely to talk with us after class, or come to our office hours to share a draft or seek advice.

- Writing gives us a window into our students' thinking and learning. Through our students' writing, we can take pleasure in discovering that students see things in course readings or discussion we didn't see; students make connections we ourselves hadn't made. And through our students' writing, we also discover what confuses our students.

- Writing assignments can improve our classroom discussions. By forcing students to keep up with readings, regular writing assignments can prepare students to participate in discussion.

- Writing assignments provide us with an opportunity to teach students to organize ideas, develop points logically, make explicit connections, elaborate ideas, argue points, and situate an argument in the context of previous research—-all skills valued in higher education.

- Students remember what they write about—-because writing slows thinking down and requires careful, sustained analysis of a subject.

- Our students and we remember what we've written, in part, because writing individualizes learning. When a student becomes fully engaged with a writing assignment, she has to make countless choices particular to her paper.

- For these reasons and more, the Association of American Colleges and Universities (AAC U) recommends writing-intensive courses as one of its high-impact practices--instructional methods proven to help students learn

subject matters across the curriculum, at every level of higher education.

- Finally, though it's much more than this, writing is a skill--a skill that atrophies when it isn't practiced regularly. Because learning to write well is difficult and because it requires sustained and repeated practice, we need to ensure our undergraduates write regularly, throughout the curriculum, in all majors. It's the responsibility of all of us to ensure that students learn to think and write clearly and deeply.

Under his guidance, the WAC program has grown into an advanced resource for faculty who are looking for the latest information on how to create an effective WAC experience in their classrooms. These resources are available on the college website, which also provides information on why incorporating WAC is a key element in learning.

3.1.3 Incorporating WAC and Writing Intensive Initiatives

The WAC program at UW-Madison integrates writing directly into the course assignments of the discipline specific curriculum courses. There are three types of communications courses offered, the Writing Intensive, Communication B, and Communication A.

"Writing-Intensive (WI) courses in the College of Letters and Science incorporate frequent writing assignments in ways that help students learn both the subject matter of the courses and discipline-specific ways of thinking and writing. Generally, WI courses are at the intermediate or advanced level and are designed specifically for majors" (University of Wisconsin-Madison, 2013).

Communication-B courses involve substantial instruction in reading and writing, in addition to speaking and listening. The goals are to master:

- critical reading, logical thinking, and the use of evidence

- the use of appropriate style and disciplinary conventions in writing and speaking

- the productive use of core library resources specific to the discipline.

Communications-A courses are designed to help the students become proficient in planning, drafting, revision, and research skills. The overall objective of this course is to "develop students' abilities in writing and public speaking for exposition and argumentation" (University of Wisconsin-Madison, 2013).

3.1.4 WAC Supporting Services

Additional partner programs provide support to the WAC programs in the form of the UW Writing Center, Writing Fellows, and the Design Lab. These partner programs have both on-campus and online resources for both faculty and students to access.

The UW Writing Center provides a number of services designed to contribute to the writing across the disciplines concepts. Online tutorials, handbooks, and other materials are available any time of the day or night. For those looking for a more personalized experience, there are individual appointments with tutors, workshops, and short-term non-credit workshops available to both students and faculty. The writing handbook is an online guide to improving writing style and correctness, and there additional guides to assist students with proper research techniques and validating sources. The Writing Fellows program emphasizes the concept of peer mentoring, allowing advanced students to mentor junior students in writing strategies. The Design Lab works

directly with students to transform their work into multimedia presentations that speak to their audience and make an impact.

The Technical Communication Program teaches the major communications courses for the undergraduate students in the College of Engineering, and collaborates directly with the College of Engineering faculty "to better understand and align the faculty expectations and communication pedagogy" (Grossenbacher   Matta, 2011). The output of this collaboration led to the creation of a series of online modules geared towards providing additional communication skills training that faculty was unable to provide in the already overburdened classroom. These courses are key to the ABET Assessment status and a particular course—Technical Communications EPD 397—is one of the key courses evaluated because it is a required course in every engineering curriculum. (University of Wisconsin-Madison, 2013).

3.1.5 Faculty Support Initiatives

An important component of WAC programs is the inclusion of the faculty in ongoing training and workshops to keep them updated on key developments in WAC theory. The faculty at UW-Madison enjoys the benefits of ongoing workshops and faculty geared training.

The university provides resources for faculty to assist them with every phase of the WAC process; these include articles on how to set up the courses, sequence the assignments, and how to evaluate the student's work. Additional faculty benefits include working with student Writing Fellows who can assist with grading and reviews of student papers. This allows the faculty more time to focus

on issues of course content without sacrificing the quality of the educational experience.

3.1.6 Summary

This research shows that the University of Wisconsin-Madison is fully committed to the integration of the WAC program, and has provided a comprehensive assortment of resources for both students and faculty.

3.2 University of Texas at Austin

3.2.1 Overview

The University of Texas at Austin is a large public research university opened in 1883 and located in Austin, Texas. Today the university serves approximately 51,000 students with a staff of over 24,000 employees, including faculty (The University of Texas at Austin, 2013).

In 1993, the Undergraduate Writing Center became part of the Department of Rhetoric and Writing (DRW) in the College of Liberal Arts. The writing center provides individualized expert help to undergraduates. Forbes ranks the University of Texas at Austin at 104, while US News   Report gives a ranking of 46 (Forbes, 2013) (U.S.News, 2013). ABET accreditation was first obtained in 1936 and they currently hold accreditation for 59 individual programs (ABET, 2013). Additionally, UT is recognized as one of the top 20 engineering universities, as ranked by the U.S. News   World Report in 2013. (The University of Texas at Austin, 2013).

3.2.2 University Commitment to the Program

The university has been fully committed to providing a variety of in person and online resources to both students and faculty for a number of years, and has branched out into several areas, which include workshops, presentations, and community engagement projects where undergraduate writers work with the community.

The Undergraduate Writing Center is a collection of student and faculty resources, with additional emphasis on Praxis, the university Peer Reviewed Journal, and a section of whitepapers that contains guidance for creating professional and publishable writings. The resources provided in the UWC are geared towards both students and faculty.

3.2.3 Incorporating WAC and Writing Intensive Initiatives

The keystone to the WAC program at the University of Texas at Austin (UT) is a core curriculum requirement named "Writing Flag" (University of Texas at Austin, 2013). A 'flag' indicates an area of study that the university has determined is an important skill or experience that the student should master.

The flags at UT include Writing, Cultural Diversity in the United States, Ethics and Leadership, Global Cultures, Independent Inquiry, and Quantitative Reasoning. These flags are classes taught across the curriculum so that the students learn about each topic in the context of their own discipline.

This requirement helps students improve their (University of Texas at Austin, 2013):

- critical thinking skills

- understanding of course content

- ability to formulate ideas in writing

- ability to write in the style of a particular discipline

Taught at all levels, these mandatory classes cover a variety of topics. In some courses, daily writings are required, while in others they may work in teams, in person or online, to prepare sections of larger reports. Each instructor customizes the writing assignments for each class to enhance the understanding of the material of the discipline along with teaching the writing required. The university level requirements are:

- Students must write regularly—several times during the semester—and complete writing projects that are substantial.

- Students must receive feedback from the instructor to help them improve their writing, and be given an opportunity to revise at least one assignment.

- Students' writing must make up at least one-third of the course grade.

3.2.4 WAC Supporting Services

The Undergraduate Writing Center, under the Department of Rhetoric and Writing, provides students with access to trained consultants who are experienced and knowledgeable in writing and trained to help students learn the mechanics of writing.

A popular feature of the writing center is *Praxis*, a peer-reviewed scholarly journal published biannually by the Undergraduate Writing Center at the university. This journal focuses specifically on writing center issues, and

encourages contributions from writing center consultants, administrators, staff members, and anyone else interested in writing center or WAC issues. There are a number of articles on the WAC program, in addition to philosophy and background, contain information about the field of rhetoric and communications.

The Digital Writing and Research Lab (DWRL) is "Positioned at the intersection of rhetoric, writing, and technology, the Digital Writing   Research Lab dedicates itself—practically, pedagogically, and theoretically—to the identification and promotion of twenty-first century literacies" (University of Texas at Austin, 2013). This lab provides students with key communicative competencies needed to compete in an increasingly technologized global environment and to:

- proficiently use current software packages and technological devices,

- effectively collaborate, synchronously and asynchronously, across spatial barriers,

- confidently produce, analyze, and share information in various digital formats,

- and efficiently manage, analyze, and synthesize multiple streams of simultaneous information.

3.2.5 Faculty Support Services

The University of Texas at Austin offers a wide variety of support services and help options to assist the faculty with the writing requirements of the students. These include course management, writing services, and professional development resources.

In addition, the DRW, DRWL, and Center for Teaching Effectiveness all provide training and support services, geared towards writing across the curriculum needs. The UWC (Undergraduate Writing Center) supports faculty members by giving individual attention to the students, presentations, and workshops (University of Texas at Austin, 2013).

The "Center for the Core Curriculum" provides additional resources and support for faculty who seek to teach a flag course. The CCC collaborates directly with the instructor to develop course materials and to provide online resources that directly relate to the course development.

"Signature courses", provided in every discipline, are for first year students. These smaller, interdisciplinary classes allow the students to interact more closely with faculty and peers. This interaction encourages learning. Large format signature courses allow students to meet with top faculty. Faculty is encouraged to create signature courses, and to share course materials across the curriculums for all types of courses in order to reduce the faculty workload. The faculty also receives mentorship from the Sanger Learning Center, an academic support center.

3.2.6 Summary

This research shows that the University of Texas at Austin is fully committed to their version of a WAC program, and has provided a selection of online and in person services for both faculty and students. They actively encourage their faculty to create and contribute to courses that fall into the WAC model.

3.3 Massachusetts Institute of Technology

3.3.1 Overview

Incorporated in 1889 1961 by the Commonwealth of Massachusetts, the Massachusetts Institute of Technology (MIT) is located in Cambridge, Massachusetts and today serves approximately 51,000 students with a staff of over 1200 faculty (Massachusetts Institute of Technology, 2013).

The Communications Requirement (CR) is the core of their WAC program. Forbes ranks the Massachusetts Institute of Technology at 11, while US News   Report gives a ranking of 6 (Forbes, 2013) (U.S.News, 2013). ABET accreditation was first obtained in 1936 and they currently hold accreditation for 24 individual programs (ABET, 2013).

3.3.2 University Commitment to the Program

The MIT faculty has practiced writing across the engineering disciplines since 1952 when the writing faculty made it a point to review and critique undergraduate engineering students papers. At that point, the writing was not an integral part of the engineering programs.

Over the years, they improved this process and in 1982 established a formal "Writing Requirement" designed to ensure that the student could write expository writings in addition to writing in the specialized language of their discipline. This initiative helped the students reach a minimum proficiency, however it still lacked in teaching advanced writing and speaking skills. "In 2000 MIT faculty passed the communication requirement, an institute-wide faculty initiative with the intention to integrate 'substantial instruction and practice in

writing and speaking into all four years and across all parts of MIT's undergraduate program" (Mya, Lerner, Craig, 2010).Here is when MIT incorporated advanced writing skills directly into the engineering writing assignments.

3.3.3 Incorporating WAC and Writing Intensive Initiatives

The MIT "Communications Requirement" has, at its core, the "Writing across the Curriculum" (WAC) educational resources, which provide written and oral communications instruction in all departments. Faculties are encouraged to share course materials across the program, in order to lessen the workload when someone is creating a new course. CI-M (Communication Intensive in Major) and CI-H (Communication Intensive in Humanities, Arts, and Social Sciences) courses are now required for every degree program.

At MIT, the WAC instructor works with the faculty to jointly prepare handouts and give lectures, and this WAC involvement increases the student mastery of technical content and reduces faculty workload (Massachusetts Institute of Technology, 2013).

3.3.4 WAC Supporting Services

The communications requirement includes face-to-face workshops for both students and faculty, in addition to several online resources. These online resources provide detailed guidance on such topics as analyzing your own style, writing strategies, grammar, understanding an assignment, and resources for speakers which include how to write a speech and the appropriate use of visuals. Students and faculty can access these online resources at any time as needed.

Communications Intensive courses begin with the faculty meeting with the "WAC lecturer". WAC lecturers (including writing advisors) bring expertise in rhetoric, communication, and writing pedagogy to the subject; initial meetings between the instructor and the WAC lecturer help to map the intersections of subject matter, disciplinary communication conventions, and pedagogical approaches (Massachusetts Institute of Technology, 2013).

MIT explains this requirement on their website by noting, "A common misconception is to think of 'writing' solely on the level of constructing grammatical sentences and therefore as elementary—something that we learn to do before we learn to think in more complex ways, and something that becomes second nature. But writing involves not only forming grammatical sentences, but also defining terms, structuring complex ideas, engaging a particular audience with awareness of their expectations, following specific lines of reasoning, using and citing relevant evidence, and more" (Massachusetts Institute of Technology, 2013). MIT has a strong commitment to ensuring that their students are capable of not only thinking, but of communicating those thoughts.

3.3.5 Faculty Support and Incentives

The MIT Online Writing and Communication Center offers resources for students and faculty in two distinct areas based upon the audience —The Writing Across the Curriculum section is primarily for faculty who want to incorporate writing into their classes, and provides informational online resources in addition to providing WAC trained lecturers and writing advisors.

For students who need assistance, the Writing and Communication Center provides assistance on writing techniques, and is independent of the discipline course, which removes this workload from the course instructor. This center is comprehensive, and provides resources for everything from writing to multimedia presentations. Students who take advantage of this resource

To assist faculty with curriculum changes, MIT provides WAC Writing Advisors and Lecturers to support the WAC mandates. These advisors work with the faculty to integrate writing and speaking communications education directly into the specific discipline courses.

3.3.6 Summary

The MIT WAC experience embraces the concepts of WAC to the fullest and continues to encourage faculty growth at their facility.

3.4 Discussion

The three main colleges examined in this study rate highly among the top engineering colleges in the United States. Each has a long standing and demonstrated commitment to writing across the disciplines practices.

The key elements in all of these programs are that the writing intensive requirements are mandatory, are required in each year of the curriculum, and that there is a significant effort to maintain faculty education and involvement. The administration of the WAC program is generally independent of the other programs, which allows them to act as an overarching governing body and to

ensure that the implementation of WAC is consistent across the university. Each of these programs are supported by a combination of on campus and online help centers, where students, and faculty, can access resources to build up their skill sets even further. The commitment of the university to the program by providing funding, resources, and time for the faculty to work on these initiatives are all contributing factors to their success.

Colleges achieve ranks for different reasons, and within other top ranked universities, there are some additional WAC features worth noting.

The University of California – Santa Barbara received the 2012 Writing Program Certificate of Excellence award for its Writing Program from the Conference on College Composition and Communication. The program offers layers of writing education based upon the level of the student. They support professional writing and provide opportunities for undergraduates to conduct independent research with expert faculty who work with them.

Yale University has a tighter focus on introducing writing requirements (WR) into specific classes, while also providing an online writing center. Yale notes that "WR courses are not watered down to accommodate writing instruction; on the contrary, because writing about a topic enhances learning, students in these courses generally achieve a deeper engagement with the subject than if they had only completed exams" (Yale College Writing Center, 2013). Yale builds the emphasis on writing in the disciplines into the core courses of each curriculum, and provides additional resources to enhance learning in the online Yale College Writing Center.

At Duke, the 'Duke Reader Project' focus is on providing the student with an experienced subject matter expert as the reader. The faculty initiatives offer engaging workshops and exchanges to entice the faculty to continue growth. The importance of faculty programs should not be underestimated.

The New Jersey Institute of Technology (NJIT) requires students to learn communications skills including writing, presentation, critical thinking, research, and understanding the audience across the curriculum.

While not all colleges have implemented a WAC program, they can still take advantage of the Purdue OWL (Online Writing Lab) program, a free online resource dedicated to the introduction of WAC programs. In addition to providing a searchable database of educational content to both faculty and students, this website provides direct links to the WAC programs of a number of colleges and universities who offer ideas, and resources to both faculty and students who are interested in the benefits of WAC programs.

CHAPTER 4

CONCLUSIONS

Writing across the Curriculum (WAC) initiatives have become part of the educational landscape and rightfully so. While the value these programs provide is not directly measurable, yet, there can be no doubt that these comprehensive programs contribute an additional dimension to the quality of the education.

The universities in this study are all established; well-respected educational institutions that have mature WAC implementations, and who enjoy continuous ongoing administrative support for these programs.

The New Jersey Institute of Technology (NJIT) is a technological university that is a good candidate for the incorporation of an independently administered WAC program. The curriculum is, like our case study colleges, complex and technical. Such a program would focus on the incorporation of communication skills across all of the curriculums, in addition to ensuring the consistency of the program implementation so that all disciplines would have equal opportunities to benefit.

The student population would benefit from the availability of a wider range of additional writing and communications resources, and the faculty from the availability of training and personal growth initiatives. The demand for students to be able to communicate clearly and to be able to write intelligently from within their disciplines is no different here than elsewhere, and will increase their desirability in the job market.

The exact implementation methodology of the WAC programs differs, but the essential concept remains the same – combining the writing into the course material of the discipline engages the student who learns both the material and how to present it within that discipline. This results in a refined communicator, one who will have the ability to address multiple audiences and be able to satisfy the informational needs of both technical and non-technical readers.

The research shows that in each of the universities, there are some key factors that contribute to the overall success of the WAC programs. These are:

- Commitment to the WAC program — in each case, the university leadership demonstrated a commitment to incorporating WAC across the program. This meant providing both educational materials and training time to faculty across the entire curriculum. These long-term commitments include resources for staff and materials.

- Incorporating WAC and Writing Intensive initiatives into the program — working with both faculty and the writing centers, the curriculum of each class has been adapted to make writing part of the learning experience. Learning is enhanced in both the discipline and the communication techniques.

- WAC Support Services — in every case, we see that in addition to incorporating WAC into the curriculum also provided are strong support services in the form of writing labs, tutors, assistants, writing programs. They support the faculty by helping the student with every component of the writing experience, and targeting what the student specifically needs. Without these supporting services, faculty would become overwhelmed and ineffective.

- Faculty Support Services — continuous improvement by the faculty ensures that the latest in pedagogical techniques are available. Providing opportunities for faculty to grow in these areas makes them better teachers, which in turn raises the quality of the university. Additional faculty benefits include initiatives, which encourage personal research and writings for publication.

WAC programs have produced positive results among graduates; communications skills are highly desirable to employers. While direct

measurement of success is complex and often anecdotal, the program is not without indicators of success. Quantitative research tells us often students interacted with an online resource, downloaded a sample document, or made an appointment in the writing center. The qualitative research can help us to understand the human behaviors — the mere fact that a student in a technology program realized there was a need to reach out to a writing center is a measure of success on its own. The desire to be able to present one's findings in a professional manner speaks volumes. Successful assignments challenge students to write, to think, and ultimately transform collections of findings into informative works. The emergence of original thinking and new ideas is the gold standard of WAC programs. This holds true for both students and faculty. Challenge their minds and they will become engaged.

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