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# Innovations in Composition Programs that Educate Engineers: Drivers, Opportunities, and Challenges

**Jon A. Leydens, Division of Liberal Arts and International Studies, Colorado School of Mines**
**Jen Schneider, Division of Liberal Arts and International Studies, Colorado School of Mines**

## ABSTRACT

Recent developments in engineering education have shaped the nature of composition programs at institutions or programs that emphasize engineering and science. Among these developments are revised accreditation guidelines and a curricular debate with a long history. Such developments highlight collaborative possibilities involving technical and humanities/social sciences faculty. This multi-case study investigates how composition programs have responded to such drivers, opportunities, and challenges. The study draws from observation, document, and interview data, and particularly interviews with composition program administrators at six institutions with significant technical emphases. Findings indicate three primary responses. First, reductions, transformations, and innovations are occurring in first-year communication courses. Second, multimodal communication, including written, oral, and visual components, is being integrated across multiple instructional contexts. Finally, strong cross-curricular communication programs are emerging in which composition faculty partner with technical faculty. Implications of these findings are discussed in light of a historical debate over cultural and utilitarian curricular emphases.

**Keywords:** composition programs, interdisciplinary collaborative opportunities, culture-utility debate

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# I. INTRODUCTION

In 1896, at the annual meeting of the Society for the Promotion of Engineering Education (SPEE), the presidential address acknowledged the crowded density of the engineering curriculum and noted that "cultural" courses may need to be eliminated. In 1905 the SPEE presidential address featured an express hope to abandon all requirements in English and foreign languages, as reportedly the humanities and social science (HSS) disciplines were "considered to have little merit to the engineer" (Gianniny, 2004, p. 327). Roughly 100 years after these comments, the outlook for HSS faculty who are engineering educators is considerably brighter, in part thanks to recent changes in accreditation criteria. As researchers have noted recently, "The capacity to serve multiple purposes is one of the enduring strengths of liberal education, and the transition to EC 2000 [in the 1990s] should provide renewed demonstrations of this quality" (Ollis, Neeley, and Luegenbiehl 2004, p. xvii). As discussed below, EC 2000 represented a significant shift in accreditation criteria by the Accreditation Board for Engineering and Technology (ABET).

Recent developments in engineering education have called for responses from composition programs at institutions or divisions that primarily serve engineers and scientists. Composition programs are traditionally concerned with theories and practices related to general academic writing and communications across the curriculum. Composition professionals have also been involved in specialized disciplinary writing. Among the recent developments in engineering education are revised accreditation guidelines, interdisciplinary initiatives, and ever-decreasing

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space in the engineering curriculum, a continuation of curricular pressures with a long history. In light of these and other factors, this multi-case study investigates how composition programs have responded to specific sets of drivers, opportunities, and challenges to enhance engineering education. It also looks at some opportunities and challenges for effective partnerships between two groups of engineering educators—composition and engineering faculty. Such partnerships may serve as illustrations of the promise and pitfalls of collaborations between and among disciplines.

The study draws from three primary data sources—an observation, documents, and interviews, with emphasis on the latter, which were conducted with composition program administrators at six ABET-accredited institutions with significant curricular emphasis on engineering. At five of those six institutions, science, technology, engineering, and mathematics (STEM) disciplines dominate the curriculum; such institutions may provide one of the clearest pictures of the potential for mutually supportive relationships between composition and engineering faculty.

To understand how composition programs have responded to recent curricular influences, certain background information is necessary. For instance, it is vital to understand the value placed on communication by the engineering education community as well as collaborative opportunities available between composition and engineering faculty. In addition, it is crucial to understand present circumstances in terms of a historical debate over culture and utility in engineering education.

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## A. The Importance of Communication in Engineering Education

Engineering education literature places strong emphasis on the importance of effective communication to excel as an engineer. For instance, the National Academy of Engineering's profile of the Engineer of 2020 stresses that

> … good engineering will require good communication. Engineering has always engaged multiple stakeholders—government, private industry, and the public. In the new century the parties that engineering ties together will increasingly involve interdisciplinary teams, globally diverse team members, public officials, and a global customer base. We envision a world where communication is enabled by an ability to listen effectively as well as to communicate through oral, visual, and written mechanisms. Modern advances in technology will necessitate the effective use of virtual communication tools. The increasing imperative for accountability will necessitate an ability to communicate convincingly and to shape the opinions and attitudes of other engineers and the public (Clough, 2004, p. 55).

The importance of communication is also evident in the American Society of Civil Engineers' (ASCE) body of knowledge for the twenty-first century, wherein one of the professional outcomes focuses on

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> [m]eans of communication [that] include listening, observing, reading, speaking, writing, and graphics. The civil engineer must communicate effectively with technical and non-technical individuals and audiences in a variety of settings. Use of these means of communication by civil engineers requires an understanding of communication within professional practice. Fundamentals of communication should be acquired during formal education (American Society of Civil Engineers, 2008, p.139).

The importance of effective communication is also evident in a 2006 report on the impact of EC 2000; in a survey of over 1,600 employers representing diverse geographic locations, industry types, company sizes, educational attainment levels, and experience evaluating engineers, employers rated the importance of the ability of new engineering hires to *communicate effectively* at the top of all student outcome Criterion 3 competencies (a-k), even above primarily technical ones (Lattuca, Terenzini, and Volkwein, 2006).

**B. Communication Emphasis: Impacts on Collaborative Opportunities between Composition and Engineering Faculty**

This emphasis on effective communication has a direct impact on both composition and engineering faculty. Potential collaborative opportunities for such faculty might occur in designing first-year composition courses, multimodal communication initiatives, and disciplinary

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writing projects. Possibilities for the former two collaborations are discussed later, and the latter below.

Today, many composition programs advocate that the teaching of disciplinary writing is best taught as a partnership between composition and engineering faculty. Significant involvement of disciplinary faculty is crucial, as they know best the habits of mind, methods of inquiry, ways of knowing, and other direct influences on disciplinary writing. Such writing encompasses, in the case of engineering, both general engineering writing and engineering discipline-specific writing (e.g., aerospace, mechanical, or petroleum engineering writing, etc.). Definitions of writing in the disciplines accentuate the key role disciplinary faculty play in teaching disciplinary writing, especially when partnering with faculty consultants from composition programs. For instance, researchers at Georgetown University highlight disciplinary faculty's vital role in disciplinary writing instruction and in collapsing the artificial dichotomy between learning disciplinary writing and disciplinary content:

> A discipline is characterized not simply by its object of inquiry but by principles governing how propositions about that object can properly elicit interest and assent, can legitimately induce in other members of this community the conviction that a particular idea is not only true but also important to know. To master a particular discipline is in part to understand how statements of truth can genuinely inform one another or be made persuasive…. [T]o know a discipline is to know, through attention to writing, how one

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> forms the truth, makes it understood and persuasive, and thereby contributes to the collaborative study undertaken by the community of scholars and writers who constitute that discipline…. We believe that, rather than putting … aside [scholarly interests and commitments], [disciplinary faculty] should make them central and use them to guide their students as emerging writers within an educational community. Then, rather than seeing their scholarship as relevant only to the *content* of their courses, teachers would see that the activity of their scholarly work is directly relevant to the way they can talk to students about writing (Slevin, Fort, and O'Connor, 1990, p.12).

Ample scholarship supports this notion that the teaching of disciplinary writing is integral to initiating apprentice or novice members into a disciplinary community (e.g., Berkenkotter, Huckin, and Ackerman, 1988; Berkenkotter and Huckin, 1993; Williams and Colomb, 1995; Winsor, 1996; Kelly, Chen, and Crawford, 1998). Such scholarship builds on the notion that the teaching of writing is a shared responsibility spread across all disciplines (e.g., Connelly and Irving, 1976; Maimon, 1981; Davis, 1984; Bernhardt, 1985). Thus, engineering faculty who seek to outsource the teaching of disciplinary writing to non-engineering departments may be clinging to an obsolete model that no longer holds credibility. Rather, the current model of teaching disciplinary writing involves a variety of partnerships between composition faculty and engineering faculty. Hence, programs that seek to teach disciplinary writing are distinguished by mutually beneficial collaborations between such faculty. In such programs, the teaching of

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disciplinary writing can be viewed as one means of achieving multiple objectives: facilitating novice members' entrance into a field, learning of course content, and augmenting critical thinking competencies.

## II. A HISTORICAL CONTEXT FOR CURRICULAR INFLUENCES ON COMPOSITION IN ENGINEERING EDUCATION: THE CULTURE-UTILITY DEBATE

Although engineering education reports value communication and compelling reasons exist for partnerships between composition and engineering faculty, such developments have occurred within a particular historical context—the culture-utility debate. That debate informs the parameters in which curricular innovation is both made possible and constrained.

Our glimpse above at calls for the elimination of non-utilitarian curricular components in the 1890s and 1900s begs larger questions. In an environment of increasing competition for space in the curriculum, how can mutually beneficial partnerships thrive between engineering and composition faculty? What should be the role of composition faculty and programs at technical universities? How do faculty at such universities conceptualize and enact the teaching and learning of communication? What opportunities and barriers exist to innovation in the teaching of communication? How do drivers such as EC 2000 and the culture-utility debate inform ideas about the future of communication programs at such universities? These fundamental questions shaped our inquiry.

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To understand the context in which composition programs have sought continuous improvement in response to ABET and other curricular influences, it is important to understand the history of a debate between cultural and utilitarian emphases within engineering education. It merits noting that herein two important histories are being occasionally conflated or summarized: the histories of HSS and composition programs, which contain both numerous differences and overlaps, and the histories of composition studies and technical writing, also similar yet distinct. Although important, a thorough treatment of these two histories rests outside the scope of this overview.

In a 2004 publication, the editors of a volume on liberal education in engineering claimed that evidence exists to

> indicate that we are in a formative, perhaps even revolutionary, period in engineering education. While the ideals of liberal education are still relevant to engineering education, the relationship between what have traditionally been termed the 'technical' and 'nontechnical' elements of engineering education is being reconceptualized, as are the elements themselves and the aims of the enterprise as a whole (Ollis, Neeley, and Luegenbiehl 2004, p xiv).

As one of the main drivers of this revolution and reconceptualization process, the editors cited EC 2000, which "freed undergraduate curricula from their disciplinary fetters, and threw down in

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their place an individual challenge to each school of engineering" to by 2001 clearly define its mission, create an appropriate curriculum, and assure student learning outcomes to achieve the mission, as well as use ongoing assessment to continuously improve programs (Ollis, Neeley, and Luegenbiehl 2004, p xii). Accreditation shifts may have also been responsible for greater emphases on communication within engineering education. Among the results of an ABET-commissioned multiyear study of the effects of changes associated with EC 2000 is an increased emphasis on verbal communication and technical writing, as reported by program chairs; of those chairs, 78% reported either some or significant increases in emphasis over a ten year-period in verbal communication in their programs, and 83% reported some or significant increases in technical writing (Prados, Peterson, and Lattuca, 2005).

The century-old culture-utility debate serves as historical framework to help understand why recent accreditation shifts provide new challenges and opportunities to HSS and composition programs. The historically recurring issue centers on a debate over whether HSS disciplines should focus on utilitarian or broader cultural concerns. As Lance Schachterle, Associate Provost at Worcester Polytechnic Institute, has described it,

> [An overview of the history of] liberal and engineering education suggests that ever since the formal organization of professional interest in engineering education in 1893, articulating an appropriate role for humanities and social sciences in engineering education has been confined to choosing which horn of a dilemma to cling to, to avoid being impaled by its opposite: *either* viewing

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> liberal education as a means of acquiring communication and other tools appropriate for the engineering vocation *or* regarding the liberal education of engineers as an end in itself, justified by the examples of established liberal education programs (Schachterle, 2004, p. 30).

On the one hand, HSS faculty perceived students as future professionals in engineering as well as citizens and complex human beings. Accordingly, they should not just be well trained but also well educated, a hallmark of a university education. For instance, HSS faculty such as those teaching literature and composition recognized early on "that the development of fluency and structure in a language requires practice and widespread reading" and that "language study embodies a world view—elements of cosmology, epistemology, aesthetic, and ethical-base for understanding and using language" (Gianniny, 2004, pp. 322-23). On the other hand, many engineering faculty traditionally held a utilitarian view wherein language was understood merely as a tool (Gianniny, 2004). The utilitarian sentiment often extended categorically to all HSS disciplines.

**A. A Brief History of the Culture-Utility Debate**

Communications and composition was one of the first disciplinary areas to be formally recognized and accepted within the general framework of engineering education, and the utilitarian vs. culture debate was particularly vibrant there (Gianniny, 2004). For instance, before 1887, MIT's only writing requirement was a one-semester freshman course called

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Rhetoric and English Composition, followed by three semesters of English literature. In the former course, both the word and emphasis on rhetoric was dropped in 1887, as was one of the required literature courses, to be replaced by a practical junior-level composition course. As one historian noted, "[thus began] a decades-long negotiation between the competing claims of culture and utility" (Russell, 2002, p. 108). These negotiations between culture and utility are described in brief in Table 1. Although the table oversimplifies some historical nuances and distinctions between composition and HSS histories, it serves as a rough guide to some culture-utility emphasis shifts. In 1896 a former composition instructor at Harvard was hired to head the MIT composition program, which was "explicitly designed to meet the writing needs of engineers" (Russell, 2002, p. 109). That composition director stressed a largely utilitarian approach to writing, wherein his emphasis was "on the demands of industry rather than on those of literary culture" (Russell, 2002, p. 110).

| **Year** | **Primary Emphasis** | **Sample Action** | **Curricular Area** |
|---|---|---|---|
| Pre-1887 | Culture | MIT requires one writing and three literature courses | Composition/ Humanities |
| 1887 | Utility/Culture | MIT reduces literature requirements and increases composition requirements | Composition/ Humanities |
| 1896 | Utility | MIT hires composition director, who emphasizes "writing needs of engineers" | Composition/ Humanities |
| 1915 | Culture/Utility | MIT switches approach, moving composition for engineers to specialized courses rather than general requirements | Composition/ Humanities |
| 1919-20 | Utility/Culture | Ohio State, Case Institute, Rensselaer Institute, and Purdue hire composition specialists to direct engineering communication programs | Composition/ Humanities |
| 1930s | Utility in practice, Culture in theory | Following the Wickenden Report, ABET predecessor Engineers' Council for Professional Development recognizes the importance of "English instruction" within the engineering curriculum | HSS |
| 1940 | Utility | Practical nature of engineering largely | HSS |

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| | | | |
|---|---|---|---|
| | | emphasized in Hammond report, which supported one semester minimum of HSS in engineering curriculum | |
| 1956 | Utility in practice, Culture in theory | ASEE publishes Gullette report, which calls for a split between "professional" and "general" education; largely failed because HSS could not argue for relevance in utilitarian engineering curriculum | HSS |
| 1960s | Utility/Culture | Debate continues as to whether HSS courses should be required separately, as general education, or integrated with the engineering curriculum | HSS |
| 1980s-90s | Utility/Culture | ABET critiqued for accreditation standards for overly prescribing curricular content, stifling innovation and partnership across disciplines | HSS |
| 2000- | Utility/Culture In flux | ABET launches EC 2000, culture-utility negotiations continue | HSS |

Table 1. Shifts in historical emphasis on culture and utility in composition and HSS

At MIT as at other institutions, the utilitarian or cultural emphases of composition programs were cyclical. Although from the early 1890s to 1915 the utilitarian emphasis reigned over a secondary emphasis on literature and culture, new MIT English department leadership in 1915 reversed that emphasis, and "utilitarian writing instruction was marginalized into specialized courses, a pattern that was repeated many times elsewhere" (Russell, 2002, p. 119). With the early exception of MIT, models appeared later in which (what are today called) composition specialists were hired to direct engineering communications programs. In 1919, such faculty were hired by Ohio State, Case Institute, and Rensselaer Institute, followed a year later by Purdue (Gianniny, 2004).

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**B. Curricular Impacts of the Culture-Utility Debate**

After the Wickenden Report, a 1923-1929 study of engineering education published in the 1930s, engineering accreditation criteria fashioned by ABET's predecessor, the Engineers' Council for Professional Development, formally recognized the place of English instruction (namely writing and speaking) within the engineering curriculum (Gianniny, 2004). One other crucial outcome of the Wickenden Report was the realization that engineering and engineering education are always embedded in social, economic, and political contexts. "It is fairly certain…" the report states, "that the engineer of tomorrow will confront new social ideals and new economic standards" (Wickenden, 1923-29, p. 1048). In an implicit nod toward the culture side of the debate, the Wickenden Report's call for integration of HSS and technical education emphasized that an "engineering curriculum of a liberal type, with all its elements—scientific, humanistic, and technological—closely selected and highly integrated, has this value for the modern industrial scientist in even higher degree" (p. 1072). However, despite the import of this report, "…through the 1940s, engineering remained, at most institutions, a highly practical subject" (Prados, Peterson, and Lattuca, p. 167).

The culture-utility debate also manifested itself in the 1940s and 1950s, when guidelines for HSS disciplines were established and solidified (Gianniny, 2004). The minimum of one half-year for HSS in the engineering curriculum was (re)affirmed by major reports on engineering education, including the Hammond (1940), Grinter (1955), Gullette (1956), and Olmstead (1968) reports (Schachterle, 2004). From the 1950s to the 1990s, the widespread requirement was that HSS courses comprised approximately 13 to 20 percent of the undergraduate engineering curriculum

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(Gianniny, 2004). However, the culture-utility debate was not exclusively about quantity but also about the character or nature of an HSS education.

The debate occurred within a larger framework in which curricular, accreditation, and other influences attempted to drive reforms, and in the case of HSS reform, often unsuccessfully. In 1956, ASEE's Gullette Report outlined a HSS curricular plan, and one of its intentions was to remove the service course stigma of HSS curricula (Gianniny, 2004). Despite the fact that liberal education has traditionally involved mathematics, science, humanities, and social sciences (Parrish, 2004), the Gullette Report recommended two stems, professional (math, science, engineering courses) and general education (HSS courses), a split still resonating today as "hard" and "soft skills." Despite its intentions, in some ways, that stem dichotomy worked in the opposite direction of the integration called for by the Wickenden Report.

So why did the Gullette Report's HSS curricular plan, with only isolated exceptions, fail? By trying to remove the service stigma, HSS faculty "also removed the direct interest of [utilitarian] engineering faculty" (Gianniny, 2004, p. 336). Even though the Gullette Report was vetted by engineering, science, and HSS faculty, HSS faculty were also able to carry out few of the proposals because "[c]ompetition for time in the curriculum, and priorities for increased science and mathematics, claimed the attention of engineering educators" (Gianniny, 2004, p. 336). Another stated reason was that "there were no [HSS] disciplines—no communities of recognized scholars to support the most innovative proposals." (Gianniny, 2004, p. 337) Therein lies an intriguing paradox: whereas the lack of strong disciplines weakened their effectiveness then,

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today it is the presence of strongly established disciplines, as we will see, that are said to potentially inhibit curricular reform.

Although the utilitarian sentiment often extended categorically to all HSS disciplines, exceptions to this viewpoint existed. For instance, a 1962 ASEE Report, when describing the importance of nontechnical courses, implied a tripartite focus on engineers, citizens, and human beings. The report says that the engineer needs to successfully communicate with others "both during and after working hours" and "requires more than technical knowledge.… He [or she] must live with other people both on and off the job. He [or she] is a citizen as well as an employee and must participate with other citizens in the making of democratic decisions." The report goes on to underscore the importance of *both* "occupational and cultural development" (ASEE, 1962, p.30). Still, little evidence exists that such ideas had significant, widespread impact on the engineering curriculum.

Several parallels between HSS and composition are common in part because of their unique histories within ASEE. Although the English Committee and later English Division within ASEE preceded its counterparts in HSS, English and HSS merged in 1965 to become what is today the Liberal Education Division (Gianniny, 2004).

**C. Accreditation Criteria and the Culture-Utility Debate**

Before EC 2000, previous accreditation criteria were criticized on multiple grounds. For instance, in those criteria the emphasis was "on examining what courses students passed rather

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than what they learned and could do, as well as a lack of encouragement for experimentation with new pedagogy and curricula" due to their excessively prescriptive character (Parrish, 2004, p. 6). Another complaint about the pre-EC 2000 criteria focused on the idea that the criteria only ensured quality around a "low common denominator" and that they forced engineering educators "into a Procrustean bed where all that really mattered for accreditation was assuring visitors that every graduate had passed a minimal number of courses distributed among various sorting bins" (Schachterle, 2004, p. 12). These and other weaknesses came most fully to the fore in the late 1980s and early 1990s, when significant input and negotiation from industry, government, and academia helped ABET revamp the criteria (Parrish, 2004; Prados, Peterson, and Lattuca, 2005).

In light of the history of the culture-utility debate, how have composition programs responded to EC 2000? Whether EC 2000 is a blessing, a curse, or something in between to HSS and composition programs may be a matter of perspective. As some researchers have noted, "[b]revity and open-endedness are two of the most striking features of EC 2000 criteria; the latter, therefore, not only permit but demand interpretation" (Ollis, Neeley, and Luegenbiehl, 2004, p. xiv). Viewed pessimistically, EC 2000's elimination of the half-year floor and the one-year ceiling (the 13-20 percent range noted above) may be interpreted as a loss of job security or any substantive role for HSS faculty in engineering education (Schachterle, 2004). Further, as noted above, the history of engineering education is replete with failed attempts to enact widespread HSS reform. One researcher lays part of the blame for that history on past accreditation practices, noting that engineering students have received little and inadequate liberal education "primarily because of the overwhelming density of requirements and resulting

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emphases placed by evaluators on the technical portion of the educational programs" (Parrish, 2004, pp. 8-9).

However, many view with optimism a number of indicators. For instance, one author sees promise in the role EC 2000 plays in promoting interdisciplinarity. "[The need] to assure that graduates are adequately prepared to enter and continue the practice of engineering…surely will require less in the way of narrow, 'stove pipe' curricula that heretofore were concentrated on providing considerable expertise within a given discipline" (Parrish, 2004, p. 9). Other researchers also see windows opening in disciplinary walls. "We believe that EC 2000 invites the full participation of all faculty involved in [the] education of engineers" (xiv), notes one research team, adding that "[t]he important difference [between old and new ABET accreditation criteria] is that HSS elements are now to be seen in relation to, rather than distinctive from, other elements" (Ollis, Neeley, and Luegenbiehl, 2004, p. xv). Within this perspective, well established disciplines may present a barrier to realizing the spirit of EC 2000 if these disciplines cannot draw from their respective strengths and simultaneously recognize the benefits of interdisciplinary and multidisciplinary collaboration.

Hope may also lie within the criteria themselves. For instance, the program outcomes in EC 2000's Criterion 3 specify what graduating students should know and be able to do, and only four of those 11 are primarily technical (ABET, 2007):

> a. An ability to apply knowledge of mathematics, science, and engineering
> b. An ability to design and conduct experiments, as well as to analyze and interpret data
> e. An ability to identify, formulate, and solve engineering

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> problems
> k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

The remaining outcomes feature various degrees of nontechnical emphases (italicized):

> c. An ability to design a system, component, or process to meet desired needs within realistic *constraints such as economic, environmental, social, political, ethical*, health and safety, manufacturability, and *sustainability*
> d. *An ability to function on multi-disciplinary teams*
> f. *An understanding of professional and ethical responsibility*
> g. *An ability to communicate effectively*
> h. *The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context*
> i. *A recognition of the need for, and an ability to engage in life-long learning*
> j. *A knowledge of contemporary issues*

But perhaps even this distinction between technical and nontechnical misses the implicit intention of EC 2000 to blur such distinctions. EC 2000 may provide insight into the long-running utilitarian vs. cultural debate. As Schachterle suggests, "Unlike so much of the previous literature about liberal education within engineering education, Criterion 3 does not separate between 'soft skills' and 'hard skills,' nor does it relegate (as often was the case earlier) humanities and social sciences to a second stem" (Schachterle, 2004, p. 22). By focusing on what students learn and are able to do, EC 2000 is "a strategy far more in accord with actual professional practice, which demands results, [and] it acknowledges the importance of the historical diversity of American educational institutions," fostering reflection on and more substantive connections between institutional and programmatic missions, goals, and objectives (Schachterle, 2004, p. 13). Futhermore, Schachterle adds, "[under EC 2000, students] must

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perform effectively as *professionals*, and presumably also as *citizens* (outcomes f, h, and j) and as self-reflective *humans* (outcomes f-j)" (Schachterle, 2004, p. 22).

Rather than seek to understand HSS curricula in general, this study focuses on composition curricula, inquiring into recent pedagogical and curricular innovations of composition programs that primarily serve engineering students. Although ABET is one only of many stakeholders shaping such innovations, it is a vital one, and we will look at how composition programs have responded to EC 2000. The study also looks at how composition programs are incorporating interdisciplinary ideas, addressing utilitarian vs. cultural aims, and forging connections with other engineering educators. A few years ago researchers mused that "[a] decade from now, we will know if this freedom [catalyzed by EC 2000] brought either invention by and integration of faculty, or simply curricular anarchy and loss of a unique opportunity to bridge the 'two cultures' of C.P. Snow" (Ollis, Neeley, and Luegenbiehl, 2004, p. xii). As we stand now closer to the end of that decade, the time has come for an update. Our study provides one aspect of that update, and serves as one gauge for the current status of the culture-utility debate between HSS and technical faculty. At a minimum, the trends described here should be watched closely for what they tell us about the state of the culture-utility debate and collaborative opportunities now and in the coming years.

## III. METHODS

The intent of this multi-case study (Bogdan and Biklen, 2003) was to understand how specific composition programs are innovating in the face of the challenges and opportunities

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presented by EC 2000 as well as other stakeholders and concerns. To convey how we investigated these issues, we explain below the study's data sources, analysis procedures, sample selection methods, and the institutional profiles of each "case" or institution in the study. We also describe the methods by which we established data trustworthiness.

**A. Data Sources**

We have drawn from three primary data sources: an observation, documents, and interviews, with emphasis on the latter. The observation occurred at the 2006 Conference on College Composition and Communication, when participants at the Writing Across the Engineering Curriculum Special Interest Group (SIG) meeting shared information about their respective programs, a topic mutually agreed upon via email prior to the conference. This observation is related to one of two sets of documents we consulted, the written program descriptions of those attending the 2006 SIG meeting. Participants at this SIG gave their consent to have their program descriptions included in this study, and agreed to have them posted on a publicly accessible website. By contrast, the second set of documents consists of publicly available web documents at each of the six institutions studied; these documents provided pre-study information on student populations, degrees offered, diverse composition program approaches, and in some cases programmatic challenges and successes.

We also interviewed the current or recent directors of these six programs in spring 2006. STEM disciplines dominate the curricula at five of these institutions, which can provide us with

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a clear picture of the potential for mutually supportive relationships between composition and engineering faculty.

All interviewees signed IRB-approved informed consent forms, which ensured their and their institution's anonymity, and each audio-taped interview was then transcribed and analyzed. The interviews were semi-structured, meaning standard questions were asked yet interviews could divert from the standard set to explore areas of interest or uniqueness. All standard interview questions appear in the Appendix.

**B. Analysis Procedures**

To better understand the selected communication programs and their shaping forces, we used the constant comparative method (Bogdan and Biklen, 2003; Glaser, 1978) to analyze the data, primarily the interview data. This method involves a highly recursive process in which we:

- Began interview data collection.
- Looked for key issues, recurrent events (later called categories of focus).
- Collected more data via interviews that provided additional incidents of the categories of focus to better understand the range of viewpoints on and dimensions in these categories.
- Wrote about the categories, describing and accounting for all the incidents in the data while searching the data for new incidents.
- Analyzed the data to understand key processes and relationships in the emerging model (categories of focus combined).
- Engaged in coding and writing as the analysis focused on the core categories.

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- Described the model and its components, categories of focus and subcategories as they have emerged from the data (described in Findings below).

### C. Methods for Establishing Trustworthiness

Trustworthiness refers to how qualitative researchers determine whether they have accurately described the settings and events, participants' perspectives, or content of documents (Guba, 1981; Skrtic, 1985). A parallel concept to the quantitative research term rigor, trustworthiness in qualitative research is generally established by using various data collection and/or data analysis methods (Creswell, 1988; Leydens, Moskal, and Pavelich, 2004). To establish the trustworthiness of our data, we used five methods in particular, (the last four of which are adapted from Creswell, 1988):

1) Separate Coding—Each author coded the interview transcripts separately, and then shared perceptions of the predominant recurring themes, revealing a high degree of interrater reliability in categories of focus.

2) Purposeful Sampling—We specifically sought participants who would be knowledgeable about writing and communication initiatives at peer institutions.

3) Triangulation—By examining crucial intersections, we triangulated the interview data with all observation data and the collected documents.

4) Rich, Thick Description—We have attempted to describe the salient participant perspectives in sufficient detail, within space limitations, to allow readers to make informed decisions regarding transferability to their own contexts.

5) Member Checking—We sent the relevant passages regarding each institution's profile and all findings statements to each respective interviewee, asking each to comment on the accuracy of any statement regarding their respective institutions; no major inaccuracies were identified, and any minor update or clarification the interviewees suggested was made before publication. Then in December 2007 we sent a full manuscript draft (minus the discussion) and requested any updates or clarifications.

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### D. Sample Selection and Institutional Profiles

Several years ago, a senior administrator at our institution compiled a list of six institutions whose liberal arts programs were seen as "peers" of our own. Although the criteria by which these particular peers were chosen were never made clear, for many years, these institutions were used as bases of comparison in curricular and budget decisions. One of our motives for conducting this study, therefore, was to identify current trends occurring within and across these composition programs. The six institutions or programs analyzed in this study came from this list. All six have as a core mission the education of engineers or applied scientists, and a summary of institutional characteristics appears in Table 2.

The profiles of the institutions in this study include geographic location, public or private status, enrollment, Carnegie classification, and degrees offered. In Table 2, institutions are listed from A to F in the order in which the interviews occurred.

| **Institution** | **Location** | **Carnegie Classification*** | **Student Population (Size**)** | **Primary Emphasis** |
|---|---|---|---|---|
| A | East coast | Private; doctoral research university | <4,000 (medium) | UG/Graduate degrees in STEM disciplines |
| B | Midwest | Public; high-research | <7,000 (medium) | UG/Graduate degrees in STEM disciplines |
| C | East coast | Private; very high-research | <7,500 (medium) | UG/Graduate degrees in STEM disciplines |
| D | East coast | Private; high-research | <3,000 (medium) | UG/Graduate degrees in STEM disciplines |
| E | West coast | Private; baccalaureate colleges—arts and sciences | <750 (very small) | UG degrees in STEM disciplines |
| F | East coast | Public; very high-research | <24,000 total, <3,000 in engineering; (large) | UG/Graduate degrees in STEM disciplines |

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* Source: (Carnegie Foundation, 2000).
** Carnegie Foundation descriptions of size are based on undergraduate population; numbers reported are for undergraduate and graduate students combined.
*** "Institution" F refers not to the institution as a whole but to a well-established liberal arts program housed within the engineering college of that institution

**Table 2: Institutional profiles**

By way of comparison, our institution is a four-year public university, located in the Rocky Mountain west. Classified as having high research activity, our institution enrolls fewer than 4,500 undergraduate and graduate students. It offers undergraduate and graduate degrees primarily in engineering and science, as well as in economics and business and international political economy.

Although those interviewed all identified themselves as either serving or having recently served in the primary leadership role in their respective Humanities, Composition, Communications, or Writing Programs, their actual titles vary widely, and also to protect anonymity, all directors are here called Writing Program Administrators (WPA). WPAs are identified by their institutional affiliations, so the WPA at Institution A is WPA-A, and so on. Although convenient, this term is admittedly also limiting since many of the interviewees, as we will see, focus on multiple communicative practices. In fact, the term WPA is probably becoming increasingly outdated given recent professional developments. For similar reasons, the term writing center has at many institutions been renamed communications center, including some institutions in this study. Likewise, the term Writing Across the Curriculum (WAC) often overlaps with Communications Across the Curriculum (CxC); since the term "communication" encompasses (among other practices) writing, the term CxC is used in most of this study.

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## IV. FINDINGS

From the study data, three primary findings emerged:

- Reductions, transformations, and innovations are occurring in first-year communications courses that feature a range of HSS content.
- Multimodal communication components including written, oral, and visual modes are being integrated across multiple curricular and instructional contexts.
- Strong CxC programs are emerging in which composition faculty are working with technical faculty to develop curricular goals and foster communication within the disciplines.

As noted below, these three findings suggest that the century-old culture-utility debate continues to inform curriculum design in some contexts. However, the ABET redesign and other drivers are changing the way technical universities integrate communication instruction in engineering education, thus changing the nature of the debate. Evidence exists to suggest interdisciplinary innovations and a loosening of previous dichotomies between hard and soft skills, between a first and second stem.

### A First-Year Composition in Flux: Downsizing, Transforming, and Innovating *in Absentia*

One finding that emerged from the study data centers on changes that have occurred or are occurring in first-year composition (FYC) courses, which generally emphasize humanities thematic content and include direct written composition instruction. Whereas FYC courses teach general academic writing, writing-in-the-disciplines courses teach disciplinary writing. Yet these two writing foci are interrelated. Among other purposes, the former builds a foundation for the latter by fostering students' entrance into a larger community of academic and public writing, so

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they are prepared to eventually learn more specialized disciplinary writing. In many FYC courses, students develop an awareness of the existence of diverse disciplinary ways of communicating. Also in various degrees, FYC prepares students to use writing as a thinking tool in any discipline as well as to learn general (and portable) writing principles, such as the importance of marshalling data to support claims. Further, the value of FYC emanates from critical thinking principles students begin to learn, such as in the areas of invention, application, analysis, synthesis, and evaluation. Given FYC's broad applicability to students' future competencies in writing, thinking, and learning, faculty from across the disciplines have a stake in FYC. Tracking FYC functions as a sort of barometer for the culture-utility debate, and for how some engineering educators are conceptualizing communication in engineering education contexts.

Within this focus category, three subcategories emerged, which center on reducing or transforming FYC or innovating in its absence. Some of these changes in FYC may be signs that disciplinary walls are breaking down and that communication is becoming productively integrated across the curriculum; other changes may suggest that communication instruction is still marginalized in engineering curricula, viewed as primarily utilitarian and, in some cases, expendable.

***1) Downsizing FYC:*** Two of the institutions in this study, D and E, reduced their FYC requirement from two courses to one beginning in fall 2006. WPA-D indicated that as part of a larger revamping of its entire core curriculum, Institution D will move from a two-semester sequence to a one-semester course, with similar yet broadly construed thematic content so

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instructors can teach to their individual strengths. Class sizes will be reduced from 25 to 20, and the new FYC course will become more writing and communications intensive; also, more attention will be placed on revision, workload consistency across sections, and assessment. Similarly, Institution E will also see a two-course sequence become one; in the past, two, four-hour-per-week courses emphasized humanities content for three hours, writing instruction for one, with significant emphasis on peer and instructor feedback and revision. In both institutions, all or almost all FYC courses were to be taught by full-time, tenured/tenure-track faculty; this will mark a departure for Institution E, which previously had among its FYC instructor base graduate students and doctoral candidates.

The drivers for this FYC downsizing varied. For Institution D, the initial driver was ABET's shift from stipulating numbers of courses to outcomes-based assessment, which drove a broader reexamination of the core curriculum. The next driver was tension between the perspectives of the engineering and humanities programs, an echo of the long-running debate over utility versus culture. While the engineering faculty saw ABET's shift as an opportunity to embed two grammar-based technical writing courses within the engineering curriculum, the humanities faculty neither had this kind of faculty nor significant interest in teaching such courses. Since total engineering student enrollment was on the decline and for other complex factors, the humanities side prevailed in advocating for broader curricular changes, including the development of the campus-wide communications-intensive course criteria described below. Such changes were seen as a tradeoff; as WPA-D noted, humanities faculty are "of two minds about [the changes]." On the one hand, the reduction significantly enhanced HSS faculty's ability to offer electives for their own majors. On the other hand, most faculty did not think that

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the FYC reduction from two semesters to one augmented the quality of students' overall education, even if class sizes dropped from 25 to 20.

Likewise, broader core curricular reforms were also part of Institution E's downsizing of FYC. WPA-E noted that "as an institution, [in the past 5-10 years] we probably have learned that … to engage students across their career and really solidify [communication] skills that we initiate here in [our] department, we need to have writing on the table elsewhere." So, she said, the desire to decentralize writing, among other factors, has contributed to the reduction of FYC requirements and the simultaneous increase of CxC requirements, detailed below. It merits noting that Institution E also requires, beyond the core course requirements, 10 courses in the humanities, more than any other institution in this study.

While Institutions D and E reduced FYC, one institution had made similar steps in 2000. Widespread curricular reforms at Institution B came in the late 1990s in part because of (regional accreditation body) North Central Association's exhortation to create a more coherent general education curriculum and simultaneously because of ABET's shift to outcomes-based assessment. Institution B removed a three-course (quarter system) writing sequence to have no FYC course requirement.

However, upon adopting a new core curriculum in 2000, they switched to the semester-system and put into place a new, second-year course that features direct communications instruction and foregrounds written, oral, and visual performances. Thus, although some on their campus called for eliminating FYC in a remote echo of the culture-utility debate, WPA-B's campus colleagues

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were ultimately convinced that a core course with direct communications instruction was necessary, and should be designed and administered by people who know how to teach communications. Since that course focuses generally on civic advocacy, it satisfied both utilitarian and cultural aims. Also, a first-year seminar course in their new core curriculum, although not taught primarily by composition specialists, was writing-intensive, and two other core courses, a first and a second-year course, depending on the instructor, included writing.

***2) Transforming FYC:*** At the same time that some institutions reduced their FYC requirements, others were transforming them. One of those transformations involved thematic content, which tends to be fairly uniform in the initial iterations of a revised course, then less so over time. In the case of Institution B's second-year communications course, the thematic focus on civic advocacy was initially consistent across instructors. However, since then WPA-B said "that [advocacy] flavor has remained, but it has become a little bit more … instructor dependent." Today, the mostly-TA taught course features mixtures of civic advocacy with environmental issues, for instance, and others have moved away from the advocacy theme altogether to explore issues of communication, technology, and more.

Within the culture-utility debate framework, advocates of utility may conceptualize such dynamism as mere inconsistency, which detracts from course quality. By contrast, for others *culture* is defined within a broad range of perspectives, and nuances of its definition evolve over time; thus, such dynamism could diminish or increase course quality, depending on the nature and emphases of the changes. In that sense, *culture* is not perceived as relativistic but a matter of commitment to a range of principles and outcomes.

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Institution D has also seen a loosening of thematic uniformity in its first-year composition requirement, although over the course of more than 20 years. "In its inception [over 20 years ago] there was a very lockstep set of books assigned, and everybody was supposed to teach the same thing," WPA-D noted. "Now, there are no particular requirements as to what books people use, [yet] there is actually probably more coherence than what people expect because people found out and sort of resolved ways of doing what they had to do, and cherry-picked the ones they like. So there's fairly good commonality, but there's no requirement for commonality." He added that while general agreement on page requirements exists, the type of assignments varies considerably. Such loosening of uniformity has resulted in pedagogical innovation, with instructors proposing themes dealing with, for example, creativity, cross-cultural contact, and the meaning of home. Such experimentation can spark interdisciplinary research and innovations among faculty and students.

WPA-F indicated that their first-year course, with a thematic focus on science, technology, and society, also began with fairly uniform assignments and thematic content (faculty collaboratively compiled their own reader) but has now become less homogeneous. She estimates that readings and assignments are now 75 percent consistent across sections but will likely become less consistent over time. In terms of HSS, EC 2000 does not mandate or even encourage strict curricular uniformity or homogeneity. In fact, curricular heterogeneity may be encouraged by the fact that EC 2000 outcomes are quite broad and that programs and institutions set their own outcomes and demonstrate how they achieved those.

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Two of the program descriptions provided by the Writing Across the Engineering Curriculum SIG members indicated that a substantial percentage of their students tested out of taking FYC. Of those that required FYC of all students, one of the programs described an FYC course that was not a composition course in the traditional sense. Rather, this course's thematic content focuses on "communication, design, human factors, and ethics." The FYC course at our own institution is similarly non-traditional, providing instruction in communication and environmental and professional ethics. The focus on ethics is in part an attempt to address EC 2000 program outcome 3f, which stipulates that engineering programs demonstrate that their graduates possess an understanding of professional ethical responsibility (ABET, 2007).

***3) Innovation without FYC:*** While some institutions in this study were downsizing or transforming their FYC requirements, two other universities were innovating without FYC. WPA-A said that "probably one of the main structural features that shapes what we do [is not having a FYC requirement]," which had been abandoned during curricular reforms initiated in the late 1960s. For nearly the past 20 years, WPA-A has been the only writing program faculty member on campus, until recently when a tenure-track communications center director joined the faculty. He said, "I've always felt [that] given … such limited resources, that in situations where you can't do everything, to do small programs that are exemplary—to make sure that what you do is really, really good. And to resist that tendency to get spread too thin."

Hence, the absence of FYC has been primary in shaping his program's identity, and that (largely) one-person program's accomplishments have been many. For instance, WPA-A has championed writing embedded in the disciplines and held at least two or three faculty development

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workshops annually, capitalizing on a project-based curriculum that he encountered when he arrived in the 1980s. These interactions with faculty have led to grants, publications, and other innovations. He also helped develop a peer tutoring program, now directed by his colleague, and developed two majors and a minor in writing. Recent changes in campus leadership have brought the issue of a FYC requirement into discussion, but WPA-A, true to his do-few-things-well philosophy, would prefer to remain focused on existing initiatives and not launch a FYC course.

Whereas Institution A had been without FYC for over 30 years, Institution C had never had a university-wide writing requirement. According to WPA-C, the absence of any required writing course "grows out of a long-standing tradition [at Institution C] that 'real men' do numbers; they don't write…. So, there's just no tradition here, and we've got to rectify that." However, as explained below, the CxC idea on the horizon will likely not involve a required writing course.

**B. Multimodal Communication: Integrating Written, Oral, and Visual Communications**

One of the most significant transformations among writing programs in this study involves a major redefinition as those programs reconfigure themselves as *communication* programs. This shift could mean more "Writing" Program Administrators may soon adding "Communication" to their titles; already "Writing" Programs are becoming "Communications" Programs, and WAC initiatives are evolving or have evolved into CxC initiatives. In this shift, we see that "Writing" instruction is widening to include not just written but also oral and visual communication as well. Four of the six programs either have integrated or are planning greater integration of written,

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oral, and visual (WOV) communications, each in unique ways. Many of these initiatives suggest a breakdown of a simplistic divide between utility and culture, emphasizing instead communication instruction across multiple contexts and purposes.

Institution A offers tutorials through its campus communications center on more than just writing, in a move that can be seen as neither exclusively utilitarian or cultural, but both. Tutors work with students on oral presentations, which can involve video-taped practices followed by a viewing and debriefing of the oral performance. WPA-A added that they would ultimately like also to offer resources for students on visual design, especially since he estimated that 70-75 percent of all Institution A students are engineering or science majors. WPA-A also indicated that he has designed and taught courses in print/digital literacy and rhetoric and visual design. For him, ABET's move "to outcome-based [assessment] rather than bean counting courses" and the lack of a definition of what it means to "communicate effectively" (EC 2000 Criterion 3g) allows for greater innovation and for each campus to interpret and enact communication uniquely.

Innovation at Institution B was also partially catalyzed by accreditation forces, this time in the form of the North Central Association (now also called the Higher Learning Commission), which exhorted WPA-B's institution to create a more coherent general education program in the late 1990s, as noted above. Out of this exigency, which occurred simultaneously with ABET's shift to outcomes-based assessment, came four core courses, one of which replaced, to some degree, a traditional first-year composition course sequence. Offered in the second year, the new core course foregrounds WOV communications. The character of that course was informed by

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humanities scholars with varied backgrounds, including composition and rhetoric, speech and visual communication. The former WPA at Institution B indicated that the course "can become a composition course in which oral and visual communication play a supportive role, or it can become a fuller, multimodal course, in which the three are supposed to be given equal weight." The two most significant challenges of teaching such a course, he said, are "finding the proper balance" of instruction in the three modes and "getting up to speed in whatever of the three you are least familiar with." Although originally taught by some faculty, that course today is taught almost exclusively by graduate students. At Institution B, WPA-B estimated that three quarters of all students major in engineering or science.

WPA-C has also designed and taught a course that emphasizes visual and verbal argument, although that course is not required. He mentioned an emerging CxC program in which the provisional guidelines involve the goal of enhancing students' abilities in written, oral, and visual communication. "Our goal is to … encourage all three kinds of [communication], [even though] the emphasis is going to vary somewhat [across courses and disciplines]." When asked to describe the most intriguing development at Institution C in the last five years in terms of composition, WPA-C noted "the increased attention to visual communication." After estimating that 65 percent of Institution C students major in engineering or science, he added that "every engineer has to make oral presentations, and they have to use graphs and tables and illustrations, and they are generally very expert with Power Point and very inept with the substance of what they put on their Power Point slides." He said this recent "move from strictly written to oral and visual [communication]" has been akin to a Kuhnian paradigm shift, "and we're now working out the paradigm, and I expect us to be doing that for a while." Like the WPAs at Institutions A

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and B, he saw ABET's move toward outcomes as a positive spur for curricular innovation. "[ABET is] moving away from simply grades and courses to looking at performance, and one of the kinds of performance that engineers have to be able to do is to write and talk…so…ABET seems to be our friend right now."

Although the triadic theme was not mentioned by the WPAs from Institutions D and E, the WPA at Institution F observed that many faculty find it challenging to enable engineering students "to understand that the conventions of professional and technical writing are different from what they were exposed to in high school, and the role of visual elements and analogies, in particular, is something that's different." An emphasis on integrating oral and written communication has been part of her department's curricular philosophy since its inception. Such an emphasis may stem from conceptualizing disciplinary writing as a means of fostering novice members' entrance into their disciplines.

The growing interest in integrating visual, oral, and written communications is also evident in several of the program descriptions provided by the members of the Writing Across the Engineering Curriculum SIG at CCCC in 2006. Of the seven program descriptions that members provided (not including our own), five explicitly mention written communications courses that integrate visual and/or oral communications. The triadic theme also surfaced briefly during the SIG discussion as an area that needs more attention in the scholarly community.

Our own institution is just now beginning to address growing instructional demands in this area. Although oral, visual, and electronic communications have been taught sporadically by

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instructors with expertise in those areas, in core courses there has been in these areas little direct, consistent instruction. This situation is beginning to change. We have hired a new faculty member with expertise in teaching oral communications, and perhaps most importantly, we have just opened a new Communications Center, with the objective of providing students feedback on oral presentation skills. The long-term goals of the center include developing visual and electronic instructional resources. We will no doubt be contending for some time with how to best integrate these areas of expertise in our own FYC course and across the curriculum. Among others, programs at the forefront of WOV integration in engineering contexts include Iowa State, Georgia Tech, and Louisiana State (ISUComm, 2006; Payne, Warnick, and Blakely-Duffelmeyer, 2006; Burnett, 2008; Powell et al., 2008).

### C. CxC Crests the Horizon: Making Communications Interdisciplinary

Data from this study indicate that CxC programs are on the rise. When most of the WPAs indicated their institutions had or did not have a formal, institutionalized CxC program, they were generally referring to the presence either of consistent faculty development workshops or of university-approved communication-intensive (CI) guidelines, or both, and most often CI guidelines. At some universities, strong support exists for such initiatives, and teams of HSS faculty are working with technical faculty to implement them, which can entail opportunities to enact compromises on the culture-utility divide. In other universities, it remains to be seen if CxC programs will receive the support needed to succeed, or if CxC will remain at the margins, a token nod to communication instruction. Of the six program directors interviewed, five of them indicated that their CxC programs were undergoing a kind of birth or rebirth, either on the

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near or not-too-distant horizon. In some instances, the decline of FYC came in tandem with the rise of CxC, spurred by an initiative to decentralize and spread out writing and, in some cases, writing instruction. These broader, whole-curriculum foci took on multiple forms.

A more extensive CxC program is under discussion at Institution A, prompted largely by a new president, WPA-A noted. Although CxC is already deeply ingrained in the project-based curriculum at Institution A, the new president is interested in establishing formal CI guidelines. Even though this formal program is currently at the concept stage, WPA-A said his discussions with the president and others lead him to sense a movement "towards something else [such as a required writing-intensive course(s) in the majors] that will have, for the first time, an institutionalized, required character." According the WPA-A's estimates, such changes "may be forthcoming within the next year or so."

Institution B's WAC/CxC story has the potential to come full circle. Institution B was once well known for its strong WAC program, and after the departure of prominent WAC leaders, the established WAC program sputtered briefly, then died, only now to experience a possible rebirth. Renewed interest in CxC emanates from faculty in select science and engineering departments, who would like to see more disciplinary communications instruction for undergraduates. Such interest has invited collaborations in which composition faculty have consulted with technical faculty on ways to meaningfully integrate communications into technical courses. When and whether that CxC phoenix will rise from the ashes will depend in large part on whether a cadre of committed faculty champions the CxC cause.

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Like at Institution A, CxC is also cresting the horizon at Institution C. Both administrators and faculty support such a move, WPA-C noted, with support from, among others, the associate dean for engineering and several senior, distinguished faculty in engineering. Although WPA-C suggested that faculty have long maintained the *status quo*, a sea change has occurred. In the 2005-06 academic year, a majority of voting faculty at Institution C approved the idea of new CI requirements, which were being drafted at the time of the interview; these requirements will not involve a single required course but will contain a set of currently evolving criteria that, if approved, all the CI courses would be required to meet. In a time of relative resource scarcity, the administration dedicated funds to hiring a new full-time faculty member to help lead this and other communications initiatives, starting in fall 2006. When asked to what factors he attributes this sea change, WPA-C noted faculty discontent with the quality of student writing and added,

> unusually for academia, I think it's the contact with reality…. Particularly for the engineers--they see the handwriting on the wall, so to speak. If all you want to do is write code, that job has already gone to India [or elsewhere]. So if our students are to be employed and to have successful careers, the … thing that our graduates tell us is that it's just overwhelmingly important to be able to communicate orally and in writing. There's just no ambiguity about that.

Although Institution D had not heretofore institutionalized CxC, ABET's emphasis on outcomes and a resolution of the aforementioned tension between the engineering and humanities

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programs' differing perspective regarding CI courses had led to a recent draft of CI guidelines. Implemented in fall 2006, the CI criteria divide CI courses into two types. In "C1" courses, although direct communications instruction may be limited in scope, communication is part of the course pedagogy, and assignments play a significant role in the course workload and include regular peer and instructor feedback with the opportunity to revise one or more of the assignments. By contrast, "C2" courses involve writing but have little to no revision, and communication skills are not part of the course pedagogy. Of all required CI courses, at least 25 percent of them must be in the major.

Although no formal CxC program currently exists at Institution E, WPA-E said that "may change in the next several years." At present two science programs and the humanities program are actively involved in discipline-specific writing initiatives, but without central coordination, oversight, or significant communication between programs. The drivers for these CxC aspirations include the humanities program's desire to see writing instruction spread across the curriculum and technical faculty's desire to see students doing more discipline-specific writing. Such overlaps may lead to interdisciplinary collaboration. Additional drivers include an upcoming regional accreditation visit, and WPA-E believes "that the development of a full-fledged Writing Across the Curriculum program will be part of our initiatives for our next [accreditation] report." Further, she noted the presence of a new Dean who holds significant interest in "the development of a true, centralized WAC program."

Although some faculty development has occurred, this remains WPA-E's most significant concern, and they are currently interviewing outside consultants to conduct CxC workshops and

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hoping for funding support. "We have [some faculty] who are sure that writing is an important skill for students to develop, but they see themselves as laboratory trained or research-oriented and just reluctant to work in areas where they feel ill-prepared." Some technical faculty would also benefit from CxC workshops since they feel "pressure in departments like Mathematics and Physics to ensure a truly superlative preparation in the quantitative methods and the content," and some instructors think attention devoted to anything else detracts from the delivery of technical content. Such instructors are ideal candidates for CxC faculty seminars, which dispel such common myths about incorporating writing in technical courses (Leydens and Santi, 2006).

At our own institution, we have found that our CxC program has led to similar opportunities for interdisciplinary collaboration. Our CI guidelines were approved by our undergraduate council in 1999, and stipulated that each undergraduate degree-granting program would designate four CI courses, generally two in the junior and two in the senior year. Faculty development workshops have occurred annually since 1998, and as of 2007 over 70 faculty members have participated, on a campus with just over 200 full-time faculty; over 40 individual faculty have received pedagogical consultations from CxC specialists. Further, several teaching collaborations have ensued, including collaborative, interdisciplinary instruction involving CxC faculty and faculty in introductory design as well as in upper-division engineering and science courses. Further, several research publications have emanated from these collaborations, involving faculty from Chemistry, Geological Engineering, Chemical Engineering, and other disciplines.

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# V. DISCUSSION AND CONCLUSION

Implicitly or otherwise, EC 2000 encourages composition and technical faculty to destabilize the terms of the culture-utility debate. That is, if sufficient faculty resources and support are givens, EC 2000 encourages collaboration and innovation. Rather than mandating that a required course happen in semester X and contain curriculum Y, EC 2000 simply requires evidence that outcomes were achieved, which can allow composition and engineering faculty to work together to forge new paths toward these outcomes. The caveat, of course, is that without resources, these programs and their associated collaborations may end up being merely symbolic. Given the above findings, meaningful collaborative work stands to bridge culture-utility divides in the FYC, CxC, and interdisciplinary areas. The discussion of these three areas below suggests a few opportunities and challenges in moving from culture vs. utility to culture *and* utility. A summary of opportunities and challenges in faculty collaborations appears in Table 3.

| **Curricular Area** | **Collaborative Opportunities** | **Collaborative Challenges** |
|---|---|---|
| First Year Composition/ Communication | ➢ Collaborating on learning outcomes of required FYC courses, specifically on what students should know and be able to do. | ➢ Negotiating curricular calls for culture and utility<br>➢ Fostering understanding of the value of broad thematic diversity and FYC. |
| Communication Across the Curriculum | ➢ Dispelling common CxC misconceptions via CxC seminars.<br>➢ Fostering learning on tacit disciplinary discourse knowledge.<br>➢ Collaborating in the design and/or teaching of technical and communications courses. | ➢ Avoiding underfunding and understaffing CxC initiatives.<br>➢ Identifying effective CxC leaders (“champions”).<br>➢ Creating and maintaining reward structures for CxC efforts. |
| Interdisciplinary | ➢ Unveiling disciplinary values, ways of knowing and communicating.<br>➢ Finding interdisciplinary | ➢ Circumventing the kitchen sink effect.<br>➢ Avoiding multidisciplinary |

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| | | |
|---|---|---|
| | opportunities to enhance both culture and utility. | illiteracy.<br>➢ Evading the outsourcing of EC 2000 Criterion 3 f-j.<br>➢ Creating and maintaining reward structures for interdisciplinary efforts. |

Table 3: Summary of collaborative opportunities and challenges in three curricular areas for composition/communication faculty and engineering/technical faculty

**A. FYC: Opportunities and Challenges**

Composition and engineering faculty should see any FYC initiative as an opportunity to collaborate. Although composition faculty hold expertise in FYC theory and practice, engineering faculty should have a voice in shaping FYC outcomes. For instance, in 1997 at our institution, in the process of designing a new FYC hybrid course (noted above), we asked all faculty via their department heads to tell us what students completing such a preparatory course should know and be able to do. When in their replies several engineering colleagues underscored the importance of knowing how to marshal data in support of knowledge claims, we deliberately augmented the amount of course instruction on diverse means of persuasion.

However, in the more fluid post-EC 2000 context, some may see new opportunities to decrease culture and bolster utility. As noted in the findings, FYC reductions occurred at three institutions. For some, these moves have overtones of the calls to eliminate "cultural courses" heard over a century ago by leading engineering educators, in most cases to make room for courses perceived as more utilitarian. On the other hand, Institution A is considering adding a new FYC course after decades without one. In the long run, the effects of such shifts will

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depend on whether any de-emphases on culture-and-utility FYC courses are accompanied by increased emphasis on culture and utility elsewhere in the curriculum.

Another influence from the FYC findings on the culture-utility debate stems from the issue of thematic diversity in FYC. WPA-B, D, and F noted in FYC courses an increasing multiplicity of thematic foci, which could be interpreted from a narrow utilitarian perspective as evidence of inconsistency or incoherence across sections of the same course. Such a perspective may emanate from familiarity with the often predefined or fairly uniform content and concepts in many engineering and science courses.

However, a broader cultural perspective could see such thematic diversity as evidence of pedagogical, curricular, and/or interdisciplinary innovation in response to evolving awareness of how students learn and evolving cultural understandings. From that perspective, thematic diversity can augment faculty's ability to address students' multiple identities as engineers, citizens, and complex human beings. The challenge remains to find a workable balance between thematic diversity that lacks even broad coherence and rigid thematic conformity that stifles innovation. On the whole, effective collaboration between composition and engineering faculty on FYC outcomes will require a degree of trust so that culture and utility concerns can be voiced and divergent perspectives can be heard and negotiated based on the perceived best interests of students and constraints of faculty resources.

**B. CxC: Opportunities and Challenges**

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While FYC was decreased at two institutions, one of the signs that culture may not be marginalized in those (and other) engineering curricula emanates from the fact that resources are being allocated toward existing or burgeoning CxC initiatives. In fact, in five of the six cases, CxC programs are expanding, under construction, or on the horizon. However, the act of learning to be a more effective communicator can involve diverse emphases on utility, culture, or both. The emphasis depends on a CxC program's larger implicit and explicit mission and goals, and how those are manifested in faculty development workshops and in technical faculty's willingness and ability to meaningfully integrate nontechnical communications concepts in technical courses. On the one hand, a CxC program that concentrates, for instance, on oral and written skill development per se may be described as primarily utilitarian. On the other hand, a CxC program that focuses on communications as a method of facilitating entrance into a discipline, learning portable critical thinking skills, and providing opportunities to meaningfully integrate appropriate nontechnical components in technical courses (and appropriate technical components in nontechnical courses) will have a stronger cultural and utility emphasis.

However, as WPA-E warns, in an increasingly crowded engineering curriculum, many believe that "any attention to something else [in technical core courses]—to writing, to context, what have you—is time taken away from this essential delivery of content that will disadvantage our students." Thus, the push toward utilitarian ends may remain strong and disciplinary walls high. One sign of hope exists for WPA-E in the collaboration among core course leaders, who have been able to agree on elements valued institution wide, such as "opportunities for writing, along with opportunities for speaking." Collaboration between CxC directors and engineering faculty can also help dispel common misconceptions about CxC, such as the myth that all writing must

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be graded or that writing cannot foster learning of technical content (e.g., see Leydens and Santi, 2006)

Certain dangers also exist in the shift of resources from FYC to CxC. Required courses obviously require resources, but in some sense, they are known quantities: one can roughly predict how many sections need to be staffed, by how many faculty, and so on. They are a part of an institution's infrastructure. CxC initiatives, on the other hand, are often much more diffuse, and as a result can be vulnerable to resource and staffing cuts. When implemented effectively, CxC initiatives can have excellent outcomes for students and faculty alike: they can represent the best of interdisciplinary collaboration and teaching (Fulwiler and Young, 1990). When done poorly, however, they risk dilution, even disappearance, and thus must spend considerable resources in proving their worth, a proof not required to the same degree of most science and math courses.

Recent research points to a preparation gap in communications—the fact that many employers are finding engineering and applied science graduates underprepared for the demands of workplace communication (Reave, 2004). If technical institutions make the choice to eliminate required writing courses and to underfund CxC programs so they disappear or become ineffectual (as in the case of Institution B), the preparation gap will continue to widen. Underfunded communications initiatives can take a number of forms, such as communication courses and CxC programs that are understaffed.

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Narratives in our study indicate the importance of the "CxC Champion," a tenure-track or tenured faculty member or team of such faculty who oversee CxC initiatives. Such teams serve as an ideal venue for collaboration between composition and engineering faculty, if both are committed to graduating—and negotiating the definition of–effective communicators.

CxC comes with other vulnerabilities as well. Technical faculty often say they feel initially underprepared to integrate communication into their own disciplinary courses, even though they may have a strong (albeit tacit) knowledge of how to write for their own discipline. Although they may support increased communication instruction, many are unsure of how to proceed. Again, such circumstances call for collaboration between composition and technical faculty, wherein the former help render explicit the tacit writing knowledge of the latter faculty.

One of our colleagues, after years of being referred to by technical faculty as "the writing expert," has devised a clever method for transcending the artificial writing-content dichotomy. With a straight face, she tells disciplinary faculty that her status as "writing expert" qualities her to be the executive editor of their fields' most prestigious journals. As expected, they object based on her lack of content knowledge, so she replies by saying that writing experts can judge good writing. And good writing is good writing in any discipline, she feigns. This discussion inevitably helps unveil the point that each discipline has similar yet different standards for evaluating not just its own disciplinary content but also discourse knowledge. That is, each discipline constitutes its own discourse community. As a scholar of engineering communication notes, "The concept of a *discourse community* implies that shared use of language is reciprocally related to membership in groups. One has to use language as others do in order to be accepted as

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a group member, and one has to think like a group member in order to use language as the group does" (Winsor, 1996, p. 9). So our colleague is ultimately conveying three critical points: a) that composition faculty cannot possibly hold thorough discourse knowledge in all disciplines, b) that disciplinary faculty hold significant (often tacit) knowledge about standards for disciplinary knowledge dissemination, and c) that the learning of disciplinary communication and content are integrated processes. Moreover, solid awareness of these three points generally emerges only via focused, collaborative dialogue among composition specialists and technical faculty.

Our research and examination of our own institution have pointed to four common models for integrating writing into the disciplines, and we list those here in terms of the degree to which they stand to foster independence of disciplinary faculty. The models also appear in the order in which we think students in a given discipline are most likely to conceptualize disciplinary writing as integral to being effective, efficient, contributing members of their field:

> 1) Disciplinary writing and communications instruction is integrated into technical courses, whose technical instructors have participated in CxC seminars and have ongoing access to CxC resources.
>
> 2) Collaborative teaching involving composition and technical faculty in technical courses, wherein the composition faculty member has input into course communication goals and opportunities for direct communication instruction. It should be noted that this model can also serve as a temporary scaffold toward the first model.
>
> 3) Linked courses, wherein composition and technical faculty purposefully align their courses so as to maximize benefit for students in both courses. For instance, students in Senior Design may be simultaneously enrolled in a technical communication course in which they learn the rhetorical and communicative nuances of writing design reports and related genres.
>
> 4) Stand alone, upper-division technical communication courses taught by composition or technical communication faculty, with input from technical faculty on learning goals and objectives.

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All four models can foster collaboration between composition and engineering faculty, and particularly the first three. Each model clearly has advantages and disadvantages, and local resources and philosophies undoubtedly shape the model(s) that work most effectively.

Although a full treatment of those advantages and disadvantages is beyond the scope of this article, technical faculty involved in models 1-3 may be justifiably concerned that their work in CxC collaborations will not count for tenure and promotion, and may choose to invest their energies in disciplinary areas in which their work is clearly rewarded. In other words, the adoption of CxC initiatives requires not only faculty buy-in from across the disciplines, but also faculty development and a renewed vision of what counts for promotion and tenure. As WPA-A puts it, "my worry… is…that we will adopt…a writing-intensive requirement without an adequate infrastructure for faculty development, and not just that kind of entry-level workshop or two, but ongoing support. And oversight. And so we'll adopt, out of some literacy anxiety, we'll adopt something we actually can't do well." This concern was echoed by multiple WPAs interviewed in this study. As institutional priorities shift, promotion and tenure guidelines should reflect those priorities, another reason CxC needs assertive advocates from across campus.

**C. Interdisciplinarity: Opportunities and Challenges**

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Additional evidence exists to suggest that EC 2000, along with other influences, has opened new opportunities for interdisciplinary collaboration. Like EC 2000, interdisciplinarity stands to break down or at least not explicitly reinforce old boundaries between first and second stems, technical and nontechnical, soft and hard skills.

Behind what we communicate is why we communicate it in a particular way, so FYC, WOV, and CxC can foster the unveiling of diverse disciplinary values and ways of knowing and communicating. When students understand those features of their and other disciplines, they are bound to possess a wider array of critical thinking and approaches to problem conceptualization and solving. Such understandings will facilitate the ability to communicate not only with other engineers, but with non-engineers and the general public.

In many cases in this study, interdisciplinary collaboration with writing programs at technical universities addresses both culture and utility. Interdisciplinary courses involving multiple dimensions of writing and ethics or civic participation not only make good sense for human beings and global citizens, but also make for better future engineers and scientists. The increase in WOV instruction across the curriculum shapes people who more are visually and electronically literate, but also better workforce communicators. And CxC initiatives encourage faculty from different disciplines to teach and publish together, which could create new models for learning as well as educate students and faculty about how to communicate within and across disciplines. It would seem that interdisciplinarity in the ideal could serve as a form of transcending divisiveness and identifying means of mutually beneficial partnerships with those once entrenched on either side of the culture-utility debate.

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However, the culture-utility debate informs interdisciplinary aims in other ways. As noted above, culture may be most vulnerable in an environment typified by competition for resources and credit hours. It is possible that the new outcomes-based accreditation practices will leave room for interdisciplinary cross-fertilization, a blurring of culture and utility in meaningful ways. Yet it is also possible that it may exacerbate this divide. One possible outcome of the move toward outcomes and away from "bean-counting," for example, is what we call the "kitchen-sink effect." This entails an FYC or HSS course (or courses) that somehow strive to meet too many ABET outcomes, because they do not occur elsewhere in the technical curriculum. What results is an unwieldy course with multiple, complex and somewhat disparate objectives, objectives that include everything but the kitchen sink. Such a course is made more problematic as it may be staffed largely by faculty with experience teaching writing but not the subject areas at hand (science and technology studies, ethics, or visual and oral communications, for example).

Signs of courses that were struggling with this "kitchen sink" effect appeared in this study, and we also know first-hand how the new ABET accreditation practices can lead to this effect. In the years following the shift to outcomes-assessment, we felt the need to defend our first-year writing and humanities course to faculty who may have felt those credits were "up for grabs" in the post-bean-counting world. As a result, objectives for the course were carefully mapped onto certain aspects of Criterion 3, themselves broadly stated, in an effort to justify the course's existence. As of this writing, the course organizers are dealing with the aftermath of that mapping, which has led to some curricular incoherence within the course. Although not dire, the concern exists that we are on a path toward what one scholar calls "multidisciplinary illiteracy,"

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where our students will have a little understanding of everything and thorough understanding of nothing (Soule and Press, 1998). As a faculty team, we are continually grappling with our need to teach the course according to our areas of expertise in HSS, and the need to justify the course within the institution's scope and mission. Our hope is that we will find a way to do both more effectively.

One other related danger of EC 2000 is that Criterion 3 f-j could be outsourced exclusively to HSS and composition faculty, wherein curriculum designers merely apportion the less technical outcomes to non-engineering courses, and engineering courses focus exclusively on the more technical outcomes. The logic of such a decision is that each faculty group can teach to their respective disciplinary strengths. Doing so, however, misses the opportunity for meaningful interdisciplinary collaboration wherein faculty and students work across the culture-utility divide; it also falsely suggests that technical objectives can or should be divorced from non-technical ones, obscuring the interrelations between the two. Moreover, doing so would lose the vision of simultaneously educating an engineer, a citizen, and a human being at multiple junctures in the curriculum. Engineering students would leave their undergraduate educations convinced that their engineering instructors, unlike their HSS instructors, had little to no interest in or concern with issues of ethics, communication, the broader contexts impacted by engineering solutions, life-long learning, and contemporary issues. Further, they would leave thinking their HSS instructors had little to no interest in students' technical abilities and capabilities. Both of these miss the interdisciplinary vision and opportunity implicit in EC 2000.

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We recognize the inherent complexity involved in faculty collaboration, particularly across disciplinary lines. Trust building and power sharing are complicated in part by differing pedagogical and epistemological perspectives. However, we have accentuated opportunities that aim toward fruitful dialogue based on mutual respect for disciplinary content knowledge, ways of seeing and knowing.

As one historian suggests, it is entirely possible that the cyclical fluctuations of composition programs between utilitarian and broader cultural aims may stem from institutional missions. "The ways in which technical schools evolved formal structures for teaching students the written conventions of their disciplines reveal the familiar conflicts between the universities' diverse missions: preservation of traditions (culture), creation of new knowledge (research), and utilitarian service" (Russell, 2002, p. 119). These conflicts could also be seen as part of a broader debate about disciplines and the future of interdisciplinarity. Interdisciplinarity, paradoxically, requires simultaneous investment in the disciplines *and* in challenging those disciplines, overcoming disciplinary boundaries. If they are to move forward, universities will have to understand this paradox, and create structures of support and reward for interdisciplinary work.

## VI. LIMITATIONS AND AREAS FOR FUTURE RESEARCH

Like any study, ours has limitations. First, its design means that we have showcased a single perspective at each institution, and this invites the possibility of hero narratives, ones that only accentuate the positive contributions of WPAs and their programs and do not reveal other,

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possibly competing, perspectives. Further, this study focuses on six institutions and was not intended to be representative of all STEM-focused institutions. Also, although we focused on it here, accreditation is only one of many drivers in a complex set of influences on culture and utility and in the trend toward interdisciplinarity. Institutional role and mission, departmental objectives, faculty talents and collaborative capabilities (it is no secret some faculty do not play well with others), budgetary realities, and other stakeholder needs, to name a few, all shape HSS and composition curricula. We opened this article with statements from former SPEE presidents, citing the crowded engineering curriculum as a reason to eliminate or reduce HSS requirements. That crowding is much more intense today.

Yet that challenge may drive innovation in new ways. Unlike other professions such as law and medicine, engineering has, despite over a century of calls to the contrary, remained "the only profession where the entry level is achieved with a four-year undergraduate degree," exacting on the discipline tremendous curricular pressure. Hence, whereas a lawyer or doctor may have had a rich liberal education as an undergraduate, the same is less likely to be the case for engineers (Schachterle, 2004, p. 14). Like its predecessors, a report published by ASEE in 1966, which again called for engineering education to be a five-year program with a pre-professional degree to be given at the end of four years, had no effect on curricula (Gianniny, 2004, p.338). Engineering has retained the structure of liberal arts degrees despite the calls to move toward models common in other professions, calls heard today by the National Academy of Engineering in their vision of the Engineer of 2020 (Clough, 2004; Clough, 2005), the former president and engineering dean of the University of Michigan at Ann Arbor (Duderstadt, 2008), and others.

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We concur with Schachterle that ultimately the debate over utilitarian vs. broader aims presents a false dichotomy and a dilemma that EC 2000 should ideally encourage us to overcome.

> Engineering education will not be well served if the liberal arts faculty or the engineering faculty assume exclusive ownership of any of these accreditation goals. The whole fabric of engineering education will be significantly strengthened if everyone engaged in creating this warp and weft works together to assure each of these eleven outcomes. Only if science and engineering faculty encourage students to work in teams, to frame technical issues within global/societal contexts, and to communicate clearly will students take such goals seriously. Similarly, if humanities and social science faculty fail to understand the importance of experimentation, mathematical modeling, and engineering design as fundamental human creative and intellectual activities, it is unlikely that students will take them seriously or reap the full benefits of what the entire institution has to offer (Schachterle, 2004, pp. 30-31).

Schachterle posits that "it is neither necessary nor desirable to be forced to choose between utilitarian-vocational or culturally enriching, self-reflective justifications for HSS." Rather, he goes on to advocate a "complementary school of thought" that draws from the strengths within engineering and the liberal arts (Schachterle, 2004, p. 32). How to achieve these ends given

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institutional goals and missions and the current state of engineering education remains a significant practical and research challenge.

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## Appendix: Interview Questions

1) I'd like to know more about your composition/writing program in general.

2) Help me understand more about [a-f below] of your composition/writing program?

   a. First Year Composition

   b. Writing Across the Curriculum/Writing In the Disciplines

   c. Required Technical Communications Courses

   d. Writing Center

   e. Anything beyond *required* Tech. Comm. course(s); other courses or initiatives (e.g., labs, online materials, etc.)

   f. Any other aspect of your program you'd like to discuss

Note: For question 2, inquire about primary changes in these areas in the past 5-10 years and primary drivers of those changes.

3) Briefly describe your Writing Program leadership roles and responsibilities. Who does what? What works well? What challenges and opportunities are presented? How do you address these challenges? Opportunities?

4) How does your WP mission fit into larger frameworks: Connections with other programs on your campus? Your school's mission? Connections with ABET? Connections to other accreditation bodies, if applicable?