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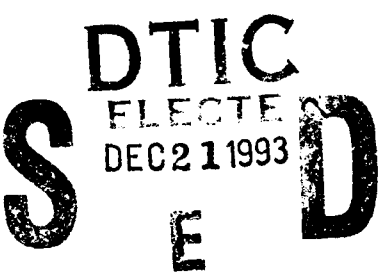

A STUDY OF UNIVERSITY EFFORTS TO PROVIDE STUDENTS WITH THE ABILITY TO COMPREHEND AND APPLY TOTAL QUALITY PRINCIPLES IN THEIR FIELDS OF STUDY

THESIS

Eugene L. Bond, Major, USAF
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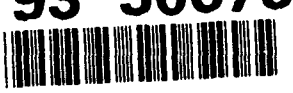

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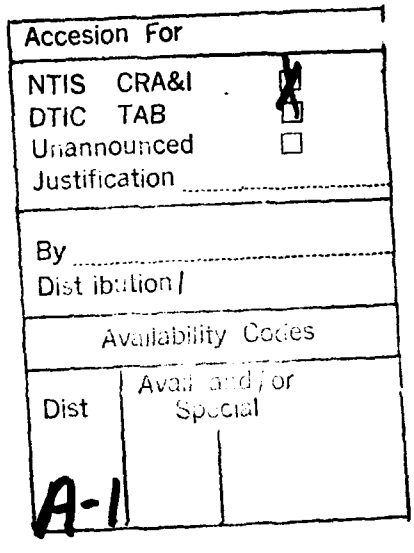

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A STUDY OF UNIVERSITY EFFORTS TO PROVIDE STUDENTS WITH THE ABILITY TO COMPREHEND AND APPLY TOTAL QUALITY PRINCIPLES IN THEIR FIELDS OF STUDY

THESIS

Presented to the Faculty of the School of Logistics and Acquisition Management
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Graduate Degree in Cost Analysis

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September 1993

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Preface

The primary purpose of this research effort was to determine the specific educational processes used by universities to enable students to comprehend and apply the principles of Total Quality. Our intent was to organize these efforts into a reportable form: a form which could serve as a guide to those institutions of higher education in the Department of Defense that are trying to prepare their students with the ability to comprehend and apply Total Quality principles. While the emphasis of this research was on application to Department of Defense institutions, we hope that the information provided herein will also provide useful guidance to private institutions seeking to educate their students in total quality principles.

This research was assisted by a number of people we would like to thank. Our thesis advisors, Major Thomas Graham and Lieutenant Colonel Larry Emmelhainz (Ret.), gave us strong focus and direction in the beginning of our research and the freedom in its execution to create our own piece of work. We would also like to thank the many dedicated and interesting participants from the government and civilian universities who devoted their valuable time sharing their experiences on Total Quality Management education initiatives and encouraging our questions. Their contributions made this work possible.

Finally, Gene and Brian want to thank their families for standing by them during the difficult writing process. Brian especially wants to thank Carol, William, and Catherine, who were always happy to help him take a break from writing.

Eugene L. Bond
Brian D. Shimel

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Abstract

This research investigated some of the educational processes which are being used by several universities to enable their students to comprehend and apply Total Quality principles. The results of this research are intended to be used by Department of Defense institutions of higher education as a guide to help them adopt practices which will enable their students to comprehend and apply Total Quality in their future assignments.

Using a source list of schools from Quality Progress (Oct 1992), points of contact were interviewed at several civilian and military universities across the United States. Investigative questions were developed and asked concerning the specific educational processes of curriculum development, course construction and delivery, and the use of various feedback techniques. The results of the interviews were consolidated, compared, and contrasted to produce a guide of activities that have been attempted by universities trying to impart the principles of Total Quality to their students. The self-reported impressions of strengths and weaknesses of the different techniques were also reported.

A STUDY OF UNIVERSITY EFFORTS TO PROVIDE STUDENTS WITH THE ABILITY TO COMPREHEND AND APPLY TOTAL QUALITY PRINCIPLES IN THEIR FIELDS OF STUDY

I. INTRODUCTION

GENERAL ISSUE

The way of doing business today is changing. Multiple revolutions in communication and transportation technology have created a world-wide marketplace, with rapidly expanding opportunities and challenges. Both the private and public sector of society are characterized today by competition and decreasing shares of resources. Consumers and taxpayers are raising the standards of what they will accept in return for their purchase or tax dollar and the status quo is no longer considered acceptable. More than ever, universities are being tasked to produce graduates ready to take on global opportunities and global competition. Solutions, though, are proving hard to find as the last breath of productivity is squeezed out of old paradigms. The search for improvement is pervasive and all-encompassing. As a source of new, revolutionary ideas, which could mean the difference between success and failure, college graduates should be in high demand. However, both civilian and government employers complain that American university graduates do not have the skills necessary to

create these ideas (Chaffee, 1990:2; Ivancevich and Ivancevich, 1992:14).

Institutions of higher education have come under attack for failing to prepare their students with the skills demanded by employers desperate to compete globally (ibid). Principal among the complaints is a lack of training in the discipline of quality improvement. Indeed, the concept of "quality" itself has been elusive for those in education. A key element of quality, however, is the desire and ability to continually meet or exceed customer expectations (Glossary of Air Force Terms). A closely related concept is "total quality" in which the desire and ability to continually meet or exceed customer expectations is obtained through an ongoing process of continuous improvement (ibid).

It is this process of total quality (TQ) that many civilian and government employers are now turning to in their efforts to regain their competitive advantage. Unfortunately, in failing to address the need to provide students with an education in total quality principles, universities are not keeping up with the priorities of the prospective employers of their graduates. Some companies, such as Motorola and General Electric, have set up their own schools rather than sponsor education for employees at universities which do not have the necessary curriculum (Kaplan, 1992:8). This loss of confidence in the schools,

coupled with steeply escalating costs for higher education, spells serious trouble for American universities.

Some schools are addressing this dilemma by adopting the same framework for change embraced by U.S. business--Total Quality Management (TQM). In many cases, TQM is the very subject that prospective employers want universities to incorporate (Arzt, 1992:iii). More and more, these employers are searching for graduates with the ability to apply total quality principles in their fields of expertise. Educational institutions run by the Department of Defense (DoD) are faced with similar, if not more immediate, demands to respond to the employers of their graduates. Rather than being faced with a drop in enrollment, DoD institutions, including the service academies, are confronted with directives to adopt the principles of TQM such as those spelled out by the commander of Air University:

> My policy is to implement TQ into all AU [Air University] curricula by the end of academic year 92-93. (Boyd, 1991).

Military institutions of higher education are trying to determine how to incorporate total quality principles into the overall instruction rendered to the student. While recent civilian and DoD efforts have centered on improving the classroom environment and the quality of teaching, attention is now being focused on modifying the curriculum to teach the students about the concepts of total quality. As with previous total quality initiatives in other areas,

teaching students how to comprehend and apply total quality principles has encountered several obstacles. One obstacle is the ongoing perception that TQM is just another quick fix scheme, a panacea to address the latest trepidation and something to tolerate until it too fades away. A second obstacle is that the procedures for adapting total quality into the educational setting remain a mystery to many university administration and faculty. Originally a production ideology, TQM's transfer from the production environment into education is not always an instinctive step (Chaffee, 1990:5). A third obstacle is the reluctance of the faculty to empower students with the responsibility of their own education. Many instructors feel that their students are not capable of determining their own educational needs, and thus do not make a systematic effort to determine their students' goals or interests (Seymour, 1989:4). Similarly, instructors are not convinced of the need for change nor are they aware of some of the successful programs employed by other universities to teach students how to comprehend and apply total quality principles. Instructors, therefore, are hesitant to disrupt their traditional teaching methods (ibid).

As with total quality education efforts in the private sector, the obstacles confronting the Department of Defense in its efforts to instruct total quality principles seem numerous and difficult to overcome. In general, the basic

question being asked by DoD planners is: what educational processes must be implemented to improve the students' comprehension and application of total quality principles for use outside of the academic environment?

SPECIFIC PROBLEM

While there is a multiplicity of problems hindering DoD university level efforts to teach total quality principles to their students, it is possible these problems could be alleviated by examining and incorporating successful total quality education programs initiated by other universities. A comprehensive examination of efforts initiated by other universities would provide useful guidance for those DoD universities looking for direction in developing total quality education programs of their own. Much of the guidance that is currently available to assist universities in the shift to total quality, however, is generally unfocused and anecdotal--leading to confusion as to what initiatives have actually produced success. It is this specific problem that this research will address: there is no comprehensive guidance available to DoD university staff and faculty to enable them to provide their students with the ability to comprehend and apply total quality principles in their fields of study.

RESEARCH OBJECTIVE

The objective of this research is to develop guidance for DoD university level institutions that will enable them to provide their students with the ability to comprehend and apply total quality principles in their fields of study. This guidance--composed of comprehensive examinations of various university efforts to teach their students total quality principles--will create a useful tool of interpretation for DoD schools struggling to translate total quality education initiatives into their own classroom environments.

RESEARCH QUESTION

The research question is the single question that best states the objective of the research (Emory, 1991:78). This research effort will focus on identifying those efforts initiated by various university programs to provide their students with the ability to comprehend and apply total quality principles in their fields of study. The key research question is therefore: What educational processes have various institutions initiated to provide their students with the ability to comprehend and apply total quality principles in their fields of study?

INVESTIGATIVE QUESTIONS

The investigative questions are those that the researcher must answer to satisfactorily answer the general research question (ibid:78). To determine what educational processes various institutions have initiated to provide their students with the ability to comprehend and apply total quality principles in their fields of study, several key investigative questions must be addressed:

1. What curriculum development methods are these institutions using to provide students with the ability to comprehend and apply total quality principles in their fields of study?
2. What course construction and delivery methods are these institutions using to provide students with the ability to comprehend and apply total quality principles in their fields of study?
3. What feedback methods are these institutions using to measure the success of their programs in achieving the objective of providing students with the ability to comprehend and apply total quality principles in their fields of study?
4. What are the general strengths and deficiencies of these processes, as observed by these institutions?

Answering these questions and analyzing the results of different university level efforts is the objective of this

research. The development of guidance for DoD educational institutions was built from this research.

SCOPE AND LIMITATIONS

The research process began with a review of current literature including education and quality-oriented journals as well as publications by companies which have sponsored conferences designed to stimulate TQM programs at universities. Literature published by those academic institutions that have adopted a formal TQ education program was also reviewed. This literature review incorporated a cross-section of various higher level institutions. Civilian universities, military academies, and professional military education (PME) schools were included. Programs implemented by civilian institutions were desired to help provide diversity that could give insight into new and unique efforts for teaching quality principles. Initial efforts made by various military schools were desired because of their direct relevance to the research objective. Comparison of the results from civilian and DoD university level institutions helped to expand the scope of analysis.

Telephone interviews with university administration and faculty were conducted to collect detailed data on specific total quality education programs developed by various institutions. Funding and time considerations limited the plausibility of alternative and redundant methods of data

collection, but every effort was made to obtain a detailed analysis of university programs.

The emphasis of this research is to provide military institutions with guidance for analyzing total quality education initiatives in the classroom. While the information derived from this research will be valuable to a wide variety of civilian and military institutions, the primary focus is to assist DoD university level institutions in tailoring a total quality education program to fit their educational environment.

It is not the aim of this research to prove that education in total quality principles is the best program for an institution to adopt. It is assumed that those interested in the results of this thesis will already have decided that educating students in total quality principles is a valuable approach. Similarly it is assumed that the environment at these institutions is receptive to making the changes necessary to adopt total quality education initiatives. The value of this research will be in providing a cross-sectional study of civilian and DoD university level efforts to provide their students with the ability to comprehend and apply total quality principles, which will in turn help those DoD institutions seeking to develop or enhance similar programs.

DEFINITIONS

The following terminology will be used in this thesis. Except as noted, the definitions used are taken directly from the Glossary of Quality Air Force Terms written by the Air Force Quality Center.

Benchmarking: The process of measuring products, services, and practices against the toughest competitors or those known as leaders in their field.

Customer: Anyone for whom an organization provides goods or services. Can be internal or external.

Empowerment: Act of placing accountability, authority, and responsibility for processes and products at the lowest possible level.

Hawthorne Effect: Every change results (initially, at least) in increased productivity.

ISO 9000 Standards: A series of written quality standards adopted by the International Organization for Standardization (ISO), an organization composed of representatives from over 90 nations (Evans and Lindsay, 1993:414-5).

Malcolm Baldrige National Quality Award (or Baldrige Award): A Congressionally authorized award that recognizes the achievements of those companies that improve the quality of goods and services and provide an example to others (Evans and Lindsay, 1993:113).

Metric: A measurement taken over a period of time, that communicates vital information about process or activity.

Paradigm: A set of rules and regulations that defines boundaries and tells what is needed to be successful within these boundaries.

Pareto Chart: A statistical method of measurement to identify the most important problems through different measurement scales.

Process Action Team (PAT): Senior leaders or process owners task a team of selected experts and volunteers to use total quality methods to analyze and improve a target process.

Quality: Consistently meeting or exceeding customer expectations.

Quality Air Force: The Air Force approach to Total Quality Management. A leadership commitment and operating style that inspires trust, teamwork, and continuous improvement everywhere in the Air Force.

Quality Circles: Quality improvement and self-improvement study groups composed of workers and their supervisor who functions as a leader.

Quality Tool: Instrument or technique that supports the activities of process quality management and improvement.

Statistical Process Control: The application of statistical techniques for measuring and analyzing the variation in processes.

Total Quality: A strategic integrated system for achieving customer satisfaction that involves all managers and employees and uses quantitative methods to continuously improve an organization's processes. Often combined with other words to indicate this approach to various organizational functions or activities, as in Total Quality Management, Total Quality Leadership, Total Quality Control, Total Quality Culture.

PREVIEW OF THE FOLLOWING CHAPTERS

This thesis will explore and analyze the efforts of various institutions that have attempted to institute total quality education programs. The literature review in Chapter II explores the state of the research into total quality education initiatives in higher education. Chapter III details the methodology of the research. Chapter IV

contains the results and analysis of the research. And finally, Chapter V contains the overall summary and conclusions. The presentation of the conclusions will be made in terms of specific areas of concern for DoD universities.

II. LITERATURE REVIEW

INTRODUCTION: THE PROCESS OF CHANGE

Most articles written in business or management publications about Total Quality Management (TQM), or Total Quality (TQ) principles, key on a common theme: this is an era of changing political climates, increased competition, and shrinking budgets--all of which should be an impetus for change. These circumstances are the same which academia faces. However, despite facing a similar situation, academia has been much slower than the business world to adopt one of the favored solutions of internationally competitive industries--Total Quality Management (TQM).

TQM is a pervasive, team-oriented management style (Dodson:35) that has successfully improved overall corporate productivity and customer satisfaction for many companies world wide (Stratton, 1991:70). Although the concept of total quality is brought up frequently in campus debates as the answer to calls for change in higher education, and despite the fact that many university processes are being examined by advocates for the possibility of including them into the framework of a TQ process improvement, its use in education "has proved controversial" (Mangan, 1992:A26). The Department of Defense (DoD) is very interested in the TQ philosophy for its education system. For example, the Air Force has adopted a program called Quality Air Force (QAF)--

the Chief of Staff of the Air Force has set the goal of incorporating TQM into all Air Force education and training programs (Boyd, 1992). Service academies, the institutions providing professional military education (PME), and military graduate universities are adopting strategies to implement total quality training initiatives, but there are no common plans or expectations about the results.

This literature review surveys the current issues confronting total quality education in military and civilian universities. To understand university initiatives to teach students total quality principles, the following areas are examined: the basic principles of total quality, including customer focus and empowerment; initiatives in total quality education by private industry; the response by academic administrators and faculty to outside calls for action; initiatives in total quality education by universities, both civilian and DoD; and current roadblocks confronting the implementation of TQ education initiatives. The articles reviewed demonstrate the extent of the debate concerning TQ in academics and the limits of the study in the area of TQ education implementation. By attempting to define these limits, the extent of the need for further study into our ultimate objective--providing guidance for enabling students to comprehend and apply total quality in their fields of study--can be established.

TQM PRINCIPLES--A CULTURAL CHANGE

Putting The Customer First. One of the vital themes of total quality is the requirement to establish the customer as the ultimate priority. The customer is defined as the individual or group for whom the particular organization is providing a product or service (Dodson:35). Most proponents argue that by putting the customer first, the organization will choose the most efficient and the most effective processes to ensure the customer's ultimate satisfaction. In short, the organization will seek to organize itself to produce the best product for the best price. Much of the debate over TQ in universities is centered on identifying the customer of education. One of the tougher challenges for universities adopting TQM, according to author Charles Bonser (Professor of Economics at Indiana University), is the issue that:

> The primacy of the customer is not a philosophy that is common in most universities. They are, of course, aware of their constituencies, but thinking of students, legislators, alumni, taxpayers, or research contractors as customers is a foreign (and sometimes offensive) concept to most faculty and staff (Bonser, 1992;508).

Still, some interesting customer candidates are being considered. One perspective is that the student is the ultimate customer of education. Another perspective is that society and, more specifically, future employers are the ultimate customers of education. The process of transferring an education to a student adds value

intrinsically to the student and extrinsically to the people and organizations towards whom the former student applies his education constructively. At first glance, both of these perspectives seem to be married in that, despite the distinction over the identity of the actual customer, the ultimate goal remains the same--ensuring that the students receive the best possible education.

It is apparent, though, that the issue of the university's customer will not be settled easily. At the first National TQM Conference in Denver, Co, in 1989, a side meeting was conducted by those interested in applying Total Quality concepts to education. Mr. Ralph Ponce de Leon, a representative from the Motorola Corporation, stated his opinion:

> We are not receiving, from any educational institution, personnel adequately educated or trained for any aspect of our business . . . At the same time, as a corporation, we give hundreds of thousands of dollars to educational institutions for the expressed purpose of improving the educational process. We feel it is time to start receiving some value from those dollars we have invested in the educational institutions so as to reduce our remedial educational expenses.

Reporting this exchange in the July-August issue of Program Manager, J.W. Gould III further writes that educators at this small, ad hoc group were placed on the defensive. An apparently angry rebuttal was offered by the Dean of Engineering from Colorado State University, in which he states the highest purpose (of the academic institution) is

for intellectual inquiry--that is, academia's business is considered to be the knowledge business (Gould, 1992:14). One TQM proponent, John A. White, Assistant Director of the National Science Foundation, believes, rather, it should be the business of producing knowledgeable people. (White, 1990:6).

Another noted TQM advocate, Dan Seymour, argues that most institutions know very little, in a systematic way, about their students and spend almost nothing to find out.

> Often they [corporate and political leaders] are surprised that we [universities] don't have goals and information systems built around quality improvement, that we can't even answer basic questions about what our students are learning. That leads them to interpose their version of assessment (Seymour, interviewed by Marchese, 1989).

Identifying students as a customer of higher education does not stop the process for TQ advocates nor does it exclude other customers from being considered as well. As quality advocate Dr. Joseph Juran states: "follow the product to see whom it impacts. Anyone who is impacted is a customer" (Juran, 1988: 24). The contention is that a single, ultimate customer does not need to exist in order to have a customer-driven organization.

Empowering the Workforce. Another commonly found term in most of the selected readings is "empowerment" of the workforce. Empowerment is defined to mean pushing the decision making capability down to the lowest possible level

(Dodson:35). Lt Col David Porter of the Air Force Academy defines the lowest possible level as the level at which sufficient information is available to make an adequate decision (Porter, 1992:193). A consequence of this process is elimination of unnecessary review layers and flatter organizational structures. Ideally, the end result is an organization giving workers more responsibility in their areas of expertise. Advocates argue that, to be successful, this worker empowerment must be "broad, flexible and pervasive" (Scott, 1989:67). As Dr. Carothers, president of the University of Rhode Island, stated in a lecture to the Air Force Institute of Technology: "Empowerment entails the establishment of a vision, then the establishment of performance standards--everything that lies between the two is freedom" (Carothers, 1992). Likewise, the TQM mentality is described as actively involving all personnel in decision-making (Ivancevich and Ivancevich, 1992;14).

For the academic environment, this means that university management delegates more power to make critical decisions; faculty have more control over curriculum structure; and students share a greater input into course design. Dr. Ellen Chaffee, Vice-Chancellor for Academic Affairs of the North Dakota School System State Board of Higher Education, answers the concern of some educators (concerning the role of students in the development of their own education) with the argument that:

> Faculty must understand what students really need to know and how they really learn, and teach accordingly . . . It does not mean teaching what tickles the faculty fancy, nor what tickles the student's fancy. It means tackling together the very difficult question of what students really need to know and how they really learn (Chaffee, 1990:5).

Taking into consideration the opinion of students is not, according to advocates, the same as letting the idle whims of the uninspired rule the resulting decisions. And, yet, ignoring valid concerns can cause real anxiety in students, who, if "deprived of a sense of control and responsibility (are) likely to invest a great deal of their resources in regaining control and a sense of self-efficacy" (Porter, 1993:3).

TOTAL QUALITY INITIATIVES

Learning From Private Industry. Many private companies, both foreign and domestic, have already benefitted substantially by adopting their own quality initiatives. Giants like Westinghouse, Hewlett-Packard, and IBM all boast of increased overall productivity, reduced waste, better manager/employee relations, and improved customer satisfaction (Scott, 1989:65-67). Military contractors such as McDonnell Douglas reported a 60% reduction in life-cycle costs and a 40% reduction in production costs on its short range missile proposal (Postula, 1990: Q.5.7). Boeing reduced its bid on the mobile missile launcher and realized costs 30-40% below the

bid during the initial production phase (Postula, 1990: Q.5.7).

Some organizations have formalized general guidelines for quality improvement. Motorola, for instance, adopted a six step process to improve service performance the same year (1988) it won the Malcolm Baldrige National Quality Award. The steps are designed to bring "white collar work" in line with the standards of production work. They address the often intangible kinds of work done by service functions and the concept of involving the whole organization in quality improvement. First, people are asked to identify their products. Next, they must identify their customer(s) and go talk to them. Third, they do the same thing with suppliers (it should be noted that customers and suppliers may be inside or outside the organization). The fourth step brings the workers, suppliers, and customers together in multi-functional, multi-level groups to map out the process. Putting the process on paper makes it easier to see the roadblocks. Step five is to consider what changes can be made to refine the process and eliminate worthless tasks. The final step is to measure whether the changes produced the desired improvements (Geber, 1990:30-31). These steps are a formula to implement and measure quality in a service organization. While guidelines such as these apply to service-oriented businesses, there are those who argue that similar initiatives adopted and taught in higher level

institutions would provide much needed quality oriented education to future graduates.

Business success stories, combined with potential savings in operation costs, have consequently generated interest for TQ in the educational arena. Civilian and DoD universities are both taking steps to employ this successful management style into their own institutions, but there is a great deal of concern about the outcomes. Management fads and other business practices have not been very successful or popular in higher education. But Ms. Chaffee writes, "Those other business practices didn't work for business either! If they had, our nation's economy would not be in its present condition" (Chaffee, 1990:4). In the opinion of Lt Col Porter of the U.S. Air Force Academy, "educators should be much more upset by the realization that assembly line assumptions of traditional American industries worked their way into our pedagogy and curriculum without notice over the last few decades, than fearful of what the application of Total Quality might do in the future" (Porter, 1993:5).

University Efforts. Initial efforts by universities to provide their students with the ability to comprehend and apply total quality principles generally fall into two major areas: (1) classes or class time specifically devoted to the subject of "quality," and (2) the infusion of quality

within every academic course taught at the institution (Caplan, 1992:63-65). In either case, the process begins with the awareness of the need for change. This initial step can sometimes create the greatest barrier. As David Gangel, Superintendent of Rappahanock Country Public Schools in Virginia, states--"total quality management is difficult because it requires change" (Axland, 1992:67). Overcoming such inertia often requires great leadership that can establish a vision (Coate, 1990:4). TQ advocates recommend that institutions unfamiliar with the TQM concept can often be aided through the use of such things as consultation with experts, designating a TQM coordinator, and sending management and instructors to get formal training in TQM (Coate, 1990:4). Others advocate presenting "Quality" awards as a beneficial method for promoting awareness (Horine, 1992:33).

The process for total quality implementation at educational institutions varies. One method suggested by Coate is to begin with "Breakthrough Planning" (also referred to as "Hoshin Planning"), that establishes a vision and determines critical goals. This is often the most critical step. The next step is to identify the critical processes that need to be modified and monitored to produce the desired results. Then, organize teams to provide critical analysis and feedback. Overall success will only be realized, however, with the final step--follow up with

daily management (Coate, 1990:5-6). Dr. Carothers relates a similar plan for carrying the quality attitude to the students. This includes establishing goals (an exercise involving both faculty and students), organizing project teams to instill teamwork, and altering instructional techniques to include less lecture and more hands on "coaching" time (Carothers, 1992).

Universities such as Oregon State and the University of Tennessee have published some of the results of their efforts to establish a TQ framework. Oregon State concentrated on using TQM to improve the operations of the school, while The University of Tennessee completely revamped their MBA program to incorporate total quality education, and published the results in the School of Business's journal, Survey of Business (McDonald, ed.: Summer 1992). John Harris of Samford University writes about how TQM applies to higher education, why education can benefit from TQM, and, in the appendix, provides Samford's recommended plan of implementation (Harris, 1990). Quality Progress lists a large number of universities across the nation reporting various levels of involvement with TQM (Axland, 1992:41-61). Some of these initiatives were based in education, some in administration. The list offers points of contact, a checklist of activities, and whether or not the institution is active in that area.

Many schools start TQ in areas other than the educational processes of curriculum, course content and delivery, and student feedback. Our research found many examples of arguments for TQ in higher education, several examples of initiatives in the university environment, some plans of action to implement TQ in the education of students, but few examples of what was actually being done to provide students the ability to comprehend and apply the principles of total quality.

DoD Training Proposals. Preliminary attempts to develop total quality processes have been made by the Department of Defense. One such process is an outline (DOD Directive 51-G) which details a seven step iterative procedure to help organizations implement quality initiatives. Briefly, these steps include: (1) Establish the Management and Cultural Environment--establish the vision and long term commitment required to get the people involved; (2) Define the mission--determine the customers requirements--this is essential to defining quality; (3) Set performance improvement goals--goals should be set to achieve TQM in all aspects of the organization's performance; (4) Establish improvement Projects and Action Plans--each member of the organization is assigned activities that will resolve functional barriers; (5) Implement Projects with Performance Tools and Methodology--

develop the proper measurements of customer satisfaction; (6) Evaluate--measure the organization's progress towards achieving the quality process; (7) Review and Recycle--reexamine the overall process and go back to step 1 (McCarthy:155-6). While this DoD approach provides general direction to organizations for implementing total quality, formalized processes for teaching individuals about the concepts of total quality have yet to be developed in the Department of Defense.

ROADBLOCKS

Management Inertia. Most of the articles in this series agreed that, despite the potential gains from implementing quality in the university setting, there are still many roadblocks that hinder successful employment. Chief among these relate to management inertia. Managers who traditionally are used to exercising tighter control on organization processes find it difficult to let go of their tight reins, often preferring to render their decisions behind closed doors (Dodson, 1991:35 and Smith, 1989:59). There are other inherent difficulties as well. Because TQM employs a nonspecific improvement process, managers are often faced with intangible measurements of process improvement. And, because of the time required to realize substantial gains from TQM (5-10 years for most organizations), its success depends heavily on basic

manager/worker capabilities and self discipline (Acker:53).

A similar problem exists with the faculty of university level institutions. Many faculty members, especially those with high tenure, are often very reluctant to relinquish any control of their classrooms to the students (Carothers, 1992). The emotional attraction of traditional teaching practices often overrides the call for new and innovative teaching techniques (ibid). Despite its potential, TQ is often regarded by management as a frustrating and unrewarding process characterized by high front-end costs and extensive training time (Scott, 1989:69).

DoD Policies. Other significant barriers to implementing TQ relate to the DoD policies themselves. This area tended to have more diversity of opinion within the various articles than other issues confronting TQ. Some articles were optimistic about the ultimate success of DoD's efforts to implement TQ strategy. Some authors, namely Doherty and Nazaruk, pointed out significant barriers including increasing budget constraints (Nazaruk, 1990:163) and ideology problems. These ideology problems center on current DoD processes that unnecessarily emphasize schedule and low price rather than high quality. There are also numerous complaints that the DoD's training program does not adequately convey important TQ concepts (Doherty, 1992:64).

SUMMARY: TOTAL QUALITY EDUCATION--HOW FAR HAS IT GONE?

The pressure that America has put on itself to make changes and compete internationally is being felt by the American educational system. The similarity is striking between the past reliance of American business on technological breakthroughs and the traditional emphasis of the American education system on individual brilliant research and discovery. Universities must respond to criticisms of existing philosophies to the extent that they desire to continue receiving money from corporations, from state governments demanding results, and from students demanding a relevant education. Weak links in the production chain are being ferreted out. The immunity academia seeks is not likely to be granted. Or, as an editorial in Business Week put it, "It's time for more accountability and a return to basics" (Business Week, 1991:158).

TQ implementation, at present, is halting and scattered. Many of the tools of TQ have great appeal to managers desperate for quick fix solutions; however, as many proponents of TQ warn, if these tools are not used in conjunction with an overall quality initiative, the result will be little more than just new ways of measuring old things--TQM is not a quick solution.

A review of the available literature found that the conceptual debate over the appropriate function of a

business and engineering solution for higher education is still very much alive. Few attempts to alter educational processes in order to incorporate total quality into the academic arena across a curriculum, a department, or a university have been documented. Universities looking for examples of what has been done by others will not find many published examples, but rather have to rely on individual contact with leading schools.

III. METHODOLOGY

INTRODUCTION: THE RESEARCH OBJECTIVE

The overall purpose of this research is to develop guidance for DoD university level institutions that will enable them to provide their students with the ability to comprehend and apply total quality principles in their fields of study. The research effort focused on discovering those processes initiated by various civilian and military university programs and on identifying how those processes can improve DoD educational initiatives. The literature review provided some initial insight into general quality improvement programs initiated by the institutions. The scope of the literature focused on improvements made to the campus environment, administration, faculty and educational atmosphere. However, current literature failed to adequately address, in sufficient detail, the specific educational processes used by the institutions to provide their students with the ability to comprehend and apply total quality principles in their fields of study. Since the information required was not readily available in the current literature, it was necessary to develop a methodology to obtain the information directly from the institutions. This chapter will discuss the overall methodology used to achieve the research objective.

RESEARCH DESIGN AND SCOPE

The research process focused on those academic institutions that have adopted a formal total quality education program. A study of different institutions (civilian and military) was desired to help eliminate bias toward a particular institution's methods. Civilian colleges, military academies, and professional military education (PME) schools were all considered to determine the different educational processes used to enable their students to comprehend and apply total quality principles within their fields of study. Telephone interviews were conducted with personnel at those universities that offered the greatest promise, or where formal literature did not adequately address the investigative questions. Department heads, teachers and administrators were chosen for interviews because of their familiarity with the educational processes employed at the institutions.

THE POPULATION SAMPLE

The Population. The population of interest consists of all university level institutions that have attempted to implement a total quality education program. Many institutions have attempted to implement total quality education to some degree--some are more advanced than others.

The Sample. The primary method of determining the respondent sample was the snowball method, in which respondents from an initial sample are used to locate or identify other potential respondents (Emory, 1991:277). The initial data sample was determined using two primary sources. The first source was the October 1992 issue of Quality Progress which provided a detailed list of over 200 civilian institutions that have incorporated total quality programs. Those institutions that provided quality related degrees were the primary targets for initial study. The second source was informal word-of-mouth recommendations from individuals knowledgeable in the subject area--this was especially the case for choosing the military service schools. Once individuals at these institutions were identified and contacted, their recommendations were then solicited for other potential respondents (either at their institutions or other institutions). Institutions that were targeted for study include:

Air University, Maxwell AFB
Clemson University
Fordham University
Jacksonville State University
North Carolina State University
United States Air Force Academy
United States Naval Academy
University of Central Florida
University of North Texas
University of Southern Maine
University of Tennessee-Knoxville
University of Vermont
University of Wisconsin-Stout

These particular institutions were chosen because they provided a cross section between civilian and military learning environments and they have employed total quality education initiatives for a sufficient length of time to become noteworthy (either by publication in journals such as Quality Progress or by word of mouth recognition by others involved in the university educational environment).

INSTRUMENT DEVELOPMENT AND TESTING

Data Collection Method. To determine the best method of follow-up data collection, several requirements were considered. First, the data required was primarily qualitative--the information sought dealt with individual institution techniques. Second, more emphasis was placed on the depth of information collected from a particular university as opposed to the breadth in numbers of universities surveyed. And third, flexibility of a "real-time" interview was desired during the data collection process since unforeseen questions were expected to arise concerning individual university techniques.

Telephone interviews provided an attractive alternative for data collection, since they tend to be less expensive and require less travel time than personal interviews (Emory, 1991:330). Personal, face-to-face interviews were not conducted since time and funding limitations prevented travel to individual universities. Telephone surveys were

preferred to mail surveys because telephone interviews allow closer interaction between the two parties (Emory, 1991:330-2). This characteristic was especially beneficial in circumstances where clarification was required on certain questions or answers. Mail surveys, while good for obtaining larger sample sizes, fall short in their capability to allow flexible avenues of questioning (ibid:333). Likewise, since the data desired was generally qualitative and expected to vary widely from the individual sources, mail surveys would not be adequate to explore the diverse questions expected for clarification on individual university efforts and results.

Telephone interviews were therefore determined to provide the most suitable means of follow-on data collection. Material published by those academic institutions (course catalogs, strategic plans, etc.) were also requested during the interviews to provide additional sources of information about the particular institutions' educational processes.

Instrument Development. To determine what educational processes various universities have initiated to provide their students with the ability to comprehend and apply total quality principles in their fields of study, the following investigative questions were addressed:

1. What curriculum development methods are these institutions using to provide students with the ability to

comprehend and apply total quality principles in their fields of study?

2. What course construction and delivery methods are these institutions using to provide students with the ability to comprehend and apply total quality principles in their fields of study?

3. What feedback methods are these institutions using to measure the success of their programs in achieving the objective of providing students with the ability to comprehend and apply total quality principles in their fields of study?

4. What are the general strengths and deficiencies of these processes, as observed by these institutions?

To fully answer the investigative questions and to facilitate the collection of data, a list of measurement questions was prepared. Measurement questions are those that are actually asked of the respondents (Emory, 1991:79). The measurement questions thus became the basis for the telephone survey questionnaire. The questionnaire consisted of a detailed series of questions, expanding in more detail on the ones above. It was designed to assist the interviewer in guiding the survey. Initial questions in the survey were straight-forward, requiring short answer or multiple choice response. The intent was to ease the respondent into the interview and to narrow the focus of subsequent answers. Follow on questions were more complex and required more thought, with more detailed qualitative responses. The overall purpose of the survey was to generate discussion on the institutions' programs rather than to obtain specific responses to specific questions.

Consideration was also given to the need to limit the duration of the survey to a reasonable time (approximately one hour). Thus tradeoffs were made between detail and duration of the survey. A copy of the telephone questionnaire used for the interview is contained in Appendix A.

Instrument Testing. Testing of the survey was conducted by giving the interview to four instructors located on site at the Air Force Institute of Technology. The test respondents were selected through association and given the interview face-to-face. A written copy of the survey questions was provided one week in advance of the interview to allow the test respondents time to review the questions and to gather any data they needed to complete the interview. The respondents were briefed on initial contact and at the beginning of the test interview to answer each question to the best of his or her ability and to comment on the clarity of the individual questions. Respondents were also asked to comment on the clarity of the survey in general and to provide suggestions for improvement. Additionally, the actual responses were evaluated to determine if the questions were constructed adequately for the desired data. Overall survey construction and individual questions were reviewed and revised after each test interview to ensure clear and accurate data collection.

Provisions were made to continue testing, if necessary, beyond the four instructors initially selected to test the survey. However, the instructors suggested only minor changes to the survey questions, and further testing was not conducted. The decision was then made to proceed with the actual telephone interviews.

SUMMARY

This research methodology is a case study of several universities that have implemented various educational processes to provide their students with the ability to comprehend and apply total quality principles within their fields of study. Data collection and analysis were conducted primarily on a qualitative vs. quantitative method. The results of the research data collection are contained next, in Chapter IV.

IV. FINDINGS AND ANALYSIS

INTRODUCTION

A total of 20 interviews were conducted between 7 May and 23 June 1993. Individuals having experience in their individual programs were interviewed to determine what educational processes university level institutions are employing to provide their students with the ability to comprehend and apply total quality in their fields of study. The duration for the telephone interviews ranged from 30 to 150 minutes. The list of questions used for the interviews is located in Appendix A. Interview summaries by individual institution are located in Appendix B.

The following general areas were examined during the interviews to determine what educational processes various institutions are using to provide their students with the ability to comprehend and apply total quality principles within their fields of study:

Curriculum development methods.
Course construction and delivery methods.
Feedback methods.
Strengths and deficiencies (as observed by these institutions).

The analysis of the 20 interviews are provided in this section. The results of the research follow.

CURRICULUM DEVELOPMENT

To determine curriculum development methods used to enable students to comprehend and apply total quality principles, the interview respondents were asked various questions concerning the different curriculum development techniques employed by their institutions. The following section discusses some of the results of these questions.

Formal Classes in Quality Improvement. Nearly all the institutions surveyed offered formal classes dealing specifically with quality improvement. Most of these institutions required the class for those students who were majoring in a particular field, such as management or industrial engineering. At Clemson University, for example, a formal class specifically dealing with quality improvement concepts is offered by the management department but is not a mandatory course. There is an additional course, however, which is mandatory for seniors in the area of Statistical Process Control (Hendrix Interview). The University of Southern Maine offers a formal class specifically dealing with quality improvement. The course, a TQM course offered by the Industrial Technology (IT) department, is a mandatory course for IT majors (Bazinet Interview).

Other universities, such as Air University, the U.S. Air Force Academy (USAFA), and the U.S Naval Academy (USNA) offer formal classes specifically dealing with quality

improvement concepts which are mandatory for all students. The USAF Academy has incorporated the philosophy into four required courses for all cadets (undergraduate students and officer candidates). All freshman cadets are exposed to the principles of TQM and the Air Force's commitment to the concept in professional development seminars taught by volunteer faculty and staff. For subsequent years, specific core courses have been modified to teach a particular aspect of TQM. For example, an upper class core course in statistics is now one half statistical process control, a sophomore management course has six lessons of instruction on TQM, a junior behavioral science course has been given a TQM perspective, and an elective behavioral science course--Organizational Behavior--is available with about one third TQM material (Porter Interview).

The majority of the institutions surveyed do not focus on any one particular advocate or approach but provide a study of several different philosophies. Of those institutions that do focus on a particular advocate, Dr. Deming's philosophy seems to be the favorite. The University of Southern Maine, for instance, does not focus on a particular advocate or approach, but features a matrix of quality approaches organized contemporarily, from past to present, including a bibliography of the writings (Bazinet Interview). At Clemson University, the TQM course does not focus on a particular advocate or approach; Deming is

emphasized, but other thinkers in the field, especially Crosby, are introduced and contrasted to Deming (Hendrix Interview). At Air University (Air Command and Staff College), courses do not focus on a particular advocate. However, the courses do focus on QAF (Quality Air Force) principles--the Air Force version of TQM--as directed by the Chief of Staff of the Air Force (Boyd Policy Letter).

Guidance for Curriculum Construction and Content.

While most institutions provided some form of guidance (formal or informal) for curriculum construction and content, very few actually enumerated requirements that provided specific guidance for teaching students to comprehend and apply total quality principles. The University of Southern Maine, for example, has informal guidance that requires "good practices" of Industrial Technology, emphasizing "people, process, product" (Bazinet Interview). Some institutions, however, are beginning to develop guidance that contains specific considerations for teaching students how to comprehend or apply total quality principles. Air University, for example, has "Fourteen Principles" directed by the Chief of Staff of the Air Force which highlights 14 specific quality subject areas (Kucharczyk Interview). These subject areas constitute informal guidance for curriculum content but do not contain specific guidelines for teaching students how to comprehend

or apply total quality principles (ibid). These 14 quality principles directed for study at Air University are:

Quality Principles
Quality Air Force
Customer Focus
Process Management
Basic Tools
Management Tools
Metrics/Measurement
Statistics
Team Dynamics
Interpersonal Skills
Quality Leadership
Strategic Planning
Assessment
Special Tools

At Air University's Squadron Officer School(SOS), the goal is for future SOS students to graduate with a "comprehension" or "application" level of learning for most of these quality subjects. Generalized guidance for providing this education in quality principles is also formalized in AFM 50-62 which is further specified in two Squadron Officer School regulations (Varn Interview).

At Air University's Air War College, the goal is for Air War College students to graduate with an "application" or "sustain and enhance" level of learning for most of these fourteen quality subjects. This will be predicated on the assumption that future officers will have a "comprehension" or better level of learning in most of these areas (which they will have received during previous Air Force training). These Air Force-wide goals will soon be formalized in the pending publication of the Quality Air Force Handbook which is designed to outline the quality education an individual

will receive from initial indoctrination and throughout the entire Air Force career (Walker Interview).

Guidance for the MBA program at the University of Tennessee consists of a White Paper, which describes the guiding principles for the development of pedagogy, the principles on how to evolve content, and the principles for deciding the appropriateness of the content. Faculty members in this program do not individually decide what they are going to teach in their particular course. Instead, the curriculum is designed through a group process that involves the (presently fifteen) core faculty (Parr Interview).

Training for the faculty (formal and informal) seems to be a favored method for those institutions providing guidance to their instructors on how to teach their students to comprehend and apply total quality principles. At the USAF Academy, for instance, formal classes for the faculty, specifically dealing with quality improvement concepts, are the primary means of educating Academy personnel about Quality Air Force. Nearly 100% of Academy staff have undergone at least the basic training in QAF. The Superintendent and two-letter (his most senior) officers attended a 2-day workshop, while other supervisors attended a 4-day workshop. All other staff members went to a 1-day course, all of which was mandatory. The courses offered do not focus on a particular quality advocate, but rather have adapted material from the Air Force Quality Center (AFQC).

They did this by building courses around the AFQC learning objectives (Stubblefield Interview). In a similar training venture for its faculty members, Fordham University provided initial training of the "Deming Scholars Program" faculty in Dr. Deming's principles; followed by the incorporation of the principles into the MBA curriculum (Orsini Interview).

Not all quality training programs, however, have been openly accepted. An interesting point to note is that both Air University's Air Command and Staff College and the United States Air Force Academy found the need to first train the faculty "subversively" (Kucharczyk and Porter) due to internal resistance to more overt attempts at this training. At the USAF Academy, collaborative efforts at improvement on the part of the involved faculty first introduced innovations that were successful. This gradually persuaded other faculty members to accompany the effort until a critical mass was reached in the department, and larger scale changes could be introduced (Porter Interview).

Application Based Formats (Internships). Most of the institutions surveyed are departing from the more traditional class lecture formats and relying much more heavily on "real situation formats" or internships to teach students to comprehend and apply total quality principles. For many institutions, this has become part of the curriculum structure, as well as individual course

presentation. At the United States Naval Academy, for instance, changes made to the general curriculum structure include an overall change in the entire four-year core curriculum for "Leadership." The original curriculum was "disjointed" and followed the following general format: freshmen--general leadership education; sophomores--counseling processes; juniors--training processes; seniors--open leadership discussions. The new leadership curriculum is structured around the following format:

> Freshmen--Followership Model--the development of principles of Dr. Steven Covey's "Seven Habits."
>
> Sophomores--application of Deming's principles and quality methodology on an actual Naval Academy problem.
>
> Juniors--Covey's Principle-Centered Leadership for the development of higher level counseling and training preparation techniques.
>
> Seniors--a capstone course where the seniors actually train their subordinates in the leadership model (Beck Interview).

This new format allows upperclassmen (sophomores, juniors, and seniors) the opportunity to apply both academic and leadership talents in a structured environment--talents learned initially during the freshmen year, in addition to skills learned throughout the entire curriculum (Beck Interview).

At Fordham University, real life scenarios are conducted in the form of the seven-week internships in which each student works full time for a particular company under the supervision of one of the company's executives. This

program is a result of a recent development at Fordham called the "Deming Scholars Program"--a fully accredited eighteen month MBA program taught in the context of Deming's principles. It is structured around five "cycles of learning." The first cycle lasts for fifteen weeks, the first eight weeks of which are in the classroom. The continuous lesson format class meets for approximately twenty hours a week and receives reading, homework, study and research assignments. The format is an integration of topics in which each topic is delivered "just-in-time" for the students to see how the subject matter fits together in the overall educational context. The classroom training is then followed by a seven-week internship at a company where the students build upon the concepts learned in the first eight weeks. This cycle is then repeated in Cycles 2 through 4. The fifth cycle contains only the classroom instruction format. The entire MBA program carries the equivalent of 70 credit hours. Dr. Deming is a senior advisor to the program (Orsini Interview).

At the University of Tennessee, an integral part of the program involves "discovery learning," a reversal of the more traditional aspect of first telling students what they need to know and then applying that knowledge; instead the approach is to have students attempt to solve various problems to determine what it is they need to know. This practice in a sense mirrors the method that the MBA faculty

operates in their exploration of better teaching techniques (Parr Interview).

Lesson vs. Course Format. At Air University (Air Command and Staff College), changes to the general curriculum structure to teach students how to apply total quality principles include an overall reduction of contact (classroom seminar) time from 5 hours per day to 3 hours per day. There is also a much greater emphasis on group activities. The basic course structure is divided into three areas:

(1) Student Self Study--read the assigned material
(2) Seminar discussion on how the material relates to their particular job or to the Air Force as a whole.
(3) Research Time (Kucharczyk Interview).

The Core Lessons at ACSC include:

Military Officership and Interpersonal Skills
Group Dynamics
Process Dynamics
Quality Metrics
Management with Quality Tools
Strategic Planning (ibid).

Each core lesson is designed to have an application phase and will vary from lesson to lesson (ibid.).

The MBA program at the University of Tennessee also uses the continuous lesson format to teach students how to apply total quality principles. The first year of the MBA program (also called the "core year") is team teaching and case study oriented. Only one course is offered per semester for the first year, while the second year encompasses a more

traditional MBA classroom approach. The first year is composed of a completely integrated holistic curriculum structuring the MBA curriculum into two courses of 15 credit hours each. The class meets for three hours a day, five days a week. During this time different instructors are invited to present various lessons in their areas of expertise such as: finance, management, customer values, international market strategies, systems, and market opportunities. Students work in teams of four to six and conduct projects together for the semester. Teams present their project work to the faculty and to industry executives. Course content during the first year of instruction is devoted solely to what <u>all</u> students <u>need to know</u> (content is determined by faculty consensus). This continuous lesson format course is conducted using an innovative team teaching style and case study method.

The second year instruction then branches out into more individualized student requirements and is conducted along the more traditional classroom format. This order of this delivery method was chosen to build the framework and thought content first. It also has the practical advantage of requiring fewer instructors than if the order of the instruction methods were reversed. The overall delivery method also better suits the needs of future employers who are looking for MBA graduates with functional specialties in particular areas. Finally, the students who have been

exposed to the more innovative techniques during the first year are actually influencing the classroom environment during the second year (Parr Interview).

Cross-Discipline or Multi-Discipline Courses. To teach students to comprehend and apply total quality principles, many institutions are emphasizing cross-discipline or multi-discipline courses. At the University of Southern Maine, the institution offers an interesting and unique multi-discipline course called "Global Enlightenment." Three instructors; one Scientist, one Social Scientist, and one Philosopher, discuss the important concepts and issues of the world. The different viewpoints expressed are intended to give students a broad, divergent picture of reality, allowing the students to decide pertinent issues for themselves. This is a core course for all students (Bazinet Interview).

The University of Wisconsin-Stout offers several cross-discipline or multi-discipline courses, such as the Quality Systems in Services Industry. This is a course in Industrial Management and is cross-listed with the Industrial Technology Department and School of Home Economics (Sedlak Interview).

At the USAF Academy, the Behavioral Science department offers cross-discipline courses, including some unlikely combinations. One combination--physics and psychology--

explores problem-solving, methods of learning, and energy transfer (external to internal) (Porter Interview).

Clemson University has conducted a revision of both the undergraduate and Master's level curriculum to meet the requirements of the international arena--including the requirement of at least two semesters of a foreign language; reducing the number of business courses in the curriculum and introducing more liberal arts courses; creating a more quantitative Master's program in Industrial Management to set it apart from the less quantitative MBA; sending Master's students through the program in "Cohort Groups" where they are assigned many team projects together; and, coordinating with professors to insert material in early courses which can be continued in successive courses by other professors (Hendrix Interview).

Guidance for teaching across disciplines varies from institution to institution. At Fordham University, teaching across disciplines is generally the rule. The proposal for new courses in the program is first reviewed by a curriculum committee which is represented by all the disciplines involved in the program. Approval for the new course is then made with the concurrence of these representatives (Orsini Interview). At the University of Tennessee, the MBA program itself is highly interdisciplinary with emphasis on business and strong links to engineering. Instructors from other departments are involved in the curriculum

construction and the lesson delivery. While the seamless structure of the MBA program (first year) makes it difficult for students from other programs to take particular MBA classes, the institution does offer a wide range of courses that are cross-listed between various departments (Parr Interview). Similarly, at Air University (Air Command and Staff College), since all students take the same curriculum at ACSC, there are no actual cross-discipline or multi-discipline courses offered. However, there is an emphasis to relate subject material to the wide range of disciplines in the Air Force (Kucharczyk Interview).

Student Participation in Curriculum Development. General philosophies on the degree of student participation in curriculum and course development are generally mixed. However, many universities are beginning to encourage increased student participation in the curriculum and course development. At Clemson University, students participate in general curriculum or program development through the Student Advisory Group. Students that make up this group are picked by the department head from the better academic students in the department and asked to participate, or from those in the TQM class (Hendrix Interview).

At the University of Southern Maine, students participate heavily in general curriculum or program development. A proposed curriculum is shown as a skeleton

to a curriculum committee made up of junior and senior students. Students from each program are invited to comment on various aspects of the curriculum, including textbook selection (Bazinet Interview).

At the University of Wisconsin-Stout, students participate in general curriculum or program development through student membership on degree program advisory committees and on the university-wide curriculum committee (one for undergraduate and one for graduate programs). The student representatives are selected by the Student Association and the Graduate Student Association, respectively (Sedlak Interview).

At Fordham University, students in the "Deming Scholars Program" are extensively involved in general curriculum and program development. Each class is composed of approximately eight to fifteen students who stay together throughout the entire program. The students that go though the program are typically those who are returning for specific education in quality principles to help their companies make the transformation to TQM. Efforts are therefore made to tailor the program to meet the specific needs of the students. Beginning with the first day of class, and periodically throughout the program, student inputs are solicited in a discussion format. The curriculum is then modified as necessary to meet the students' needs.

Changes are determined primarily through consensus of the students and teachers (Orsini Interview).

On the other hand, students at the University of North Texas do not directly participate in general curriculum or program development. Some input is assumed through the formal feedback system and traditional course critiques for undergraduates. Graduate students have a much greater impact through their selection of courses to match their specific needs. The university is more responsive to them because they can fill some teaching duties and are perceived as having more ability to contribute to the research being conducted by the institution. Graduate students, then, have more of a role in developing courses and in the ownership of a program (Prybutok Interview).

At Air University (Squadron Officer School), students do not actually participate in the development of the curriculum or individual lesson plans; however, students do participate in program development through an extensive goal-setting period which is conducted at the beginning of the class year. Here, students will, individually and collectively, set academic and athletic goals for their particular section. A key aspect of the application of goal setting is the process-review period conducted twice each week in which each section will brief their flight commander on their metrics and their progress toward their objectives. In order to have an effective process review, it is

essential for the students to have good grasp of metrics (Varn Interview).

At the University of Tennessee, students participate in general curriculum or program development through ongoing focus groups conducted at the end of each semester and throughout the year. The management faculty meets weekly for an hour and a half to discuss curriculum. A student representative is invited to speak for the students. Also, student-run "town meetings" are conducted once a month in which faculty representatives are present to discuss and deal with curriculum-related issues (Parr Interview).

Guidelines for Regulating Student Workload. It was difficult to find a trend in guidelines for regulating student workload. Many universities are concerned with the realistic requirements of accreditation and the desire to maximize the student's education, offset by the need to not overwork the student. Most schools establish certain limits on the number of semester hours taken by the individual student. For instance, at North Carolina State University, guidelines for regulating student workload are the following semester hours: For undergraduates, normally 18 hours maximum, unless specific permission is obtained from the major department head; 21 hours maximum, unless specific permission is obtained from the dean. For graduate level, normally 12 semester hours--and most take 9 semester hours

when conducting classes in conjunction with research assistantships (Johnson Interview). At Jacksonville State University, guidelines for regulating student workload are: normal load--16 semester hours (waivable by the department head); full time status is a load of 12 semester hours; and the maximum load is 21 semester hours (not waivable) (Aman Interview).

DoD institutions have various guidelines for regulating student workload. The USAF Academy, (like the other service academies) attempts to maximize what it asks of the cadets' time. Therefore, time studies are done regularly in order to keep activities--including academics--in balance (Porter Interview). At Air University's Air Command and Staff College, guidelines for regulating student workload are very intense: three contact hours a day followed by five to seven hours of self-study and several (unspecified) hours of research. Expected workload on an average day exceeds fifteen hours with over 200 pages of required reading (Kucharczyk Interview). The Air War College's guidelines at Air University for regulating student workload are 3 to 4 hours per day of contact time which is comprised on the average of 30% lecture and 70% active seminar. Reading workload consists of an average of 30,000 words per night. Writing workload consists of an aggregate of 100 written pages per year (Walker Interview).

Methods for determining the optimum student workloads vary with the institution. At the United States Naval Academy, for instance, guidelines for regulating student workload were developed using a time study of the students' weekly workload with the intent to balance professional time, fleet time, academic time, and personal time. Academic workloads for individual students however are not specifically limited (Beck Interview). At the University of Central Florida, guidelines for regulating student workload are programmed into an automated Expert System Advisor. This computer program was developed by the university and is used like an actual advisor. If the student attempts to take a course which conflicts with something else, or exceeds the limited course hours, the Advisor warns him/her of the mistake and prevents it (Swart Interview).

COURSE DEVELOPMENT AND DELIVERY

To determine course development and delivery methods used to enable students to comprehend and apply total quality principles, the interview respondents were asked various questions concerning the different course development and delivery techniques employed by their institutions. The following section discusses some of the results of these questions.

Inviting Outside Employers to Talk to the Students. Many institutions are inviting prospective employers to speak to the students in order to relate their expectations of future employees. At North Carolina State University, outside employers, including business leaders and CEOs, are invited to talk to the students. The College of Management does this through a series of total quality forums, four times a semester (for the last two years). A workshop is also conducted with integrated manufacturing systems, where monthly meetings are held with business leaders (Johnson Interview). Clemson University frequently invites outside employers (business leaders, CEOs) to talk to the students. Clemson takes advantage of the fact that many retirees live in the area--these retired executives are often asked to share their experience in class (Hendrix Interview). The University of Southern Maine occasionally invites outside employers to talk to the students, especially for the afternoon and evening classes when the speakers are more likely to be available (Bazinet Interview).

Similar techniques are employed by other universities. At the University of Central Florida, rather than invite outside employers to talk to the students, videotapes are used which are prepared by outside employers to communicate the selected message (Swart Interview). The University of Vermont does not frequently invite outside employers (business leaders, CEOs) per se, but more often invites

outside technical people who are working in the fields that graduates are most likely to be involved in. The School of Business has a regular seminar series and at least one marketing manager has been invited to speak (Haugh Interview). The University of Tennessee frequently invites outside employers to talk to the students (at least once a week). Additionally, these outside employers will not only deliver presentations to the students, but sometimes hear and comment on presentations given by the students (Parr Interview).

Team Teaching. Another common technique to help provide students with the ability to comprehend and apply total quality principles is team teaching--inviting instructors from the same or different disciplines to teach various lessons. This is often done to provide students with alternative viewpoints of the issues being discussed. Many institutions, including the University of Southern Maine, Fordham University, and Air University (Squadron Officer School) regularly invite instructors from the same department to teach (Bazinet, Hessel and Varn Interviews). At the United States Naval Academy, military and civilian instructors are paired up to team teach in order to provide a real-world focus on the perspectives in the civilian community (Beck Interview). At North Carolina State University, a tele-conferencing network is often used to

allow instructors from other universities to teach (Johnson Interview). The University of Southern Maine, employs a unique follow-on team teaching method. Professors who taught students in previous semesters are invited back in follow-on courses to appear as guest instructors--the purpose is to reapply material previously taught toward relevant issues in the current course, effectively validating and expanding on the prior learning (Bazinet Interview).

Employer Lesson Plans. Another common technique to provide students with the ability to comprehend and apply total quality principles is incorporating lesson plans developed by prospective employers within their own lesson plans. At the University of Wisconsin-Stout, lesson plans developed by prospective employers have been used extensively. General Motors' "Target to Excellence," Ford's "Q-101," and Xerox's "Benchmark for Problem Solving" were given as examples (Carlson Interview). At North Carolina State University, lesson plans developed by prospective employers are incorporated into individual course lesson plans--prospective employers were used to benchmark the objectives and course content for one experimental course, and an outside consultant was used to provide a week's worth of instruction for the time management portion of the course (Johnson Interview).

At the USAF Academy, lesson plans developed by prospective employers are used extensively. The lessons have "stolen liberally from every command's course." Additionally, training tools developed by corporations engaged in TQM have also been used to develop course material (Stubblefield Interview). At Air University (Air War College), lesson plans developed by prospective employers, such as operational readiness inspection (ORI) plans, are incorporated into the school lesson plans (Walker Interview).

Another perspective was offered by Fordham University, which is less confident of employer-developed lesson plans. Input for lesson content is solicited from prospective employers. However, the actual lesson plans developed by these employers are not used because it is believed that these employers may not be fully aware of what material is best for the students (Orsini Interview).

Group Discussion Techniques. All of the institutions interviewed employ various forms of group discussion techniques to enable their students to comprehend and apply total quality principles. At the University of Southern Maine, one favorite technique is to split the class into different groups, with one group presenting a topic; the next group defending the given position; and the third group criticizing the position. The point/counter-point argument

stimulates student involvement and subsequent retention of the material (Bazinet Interview). At Air University, extensive use is also made of daily group discussion to discuss relevance of the material to current DoD perspectives. (Kucharczyk, Varn, and Walker).

Student Team Exercises. Nearly all of the universities interviewed place great emphasis on the importance of learning to work in teams as part of the overall effort to learn to apply quality principles. At the University of Southern Maine, for instance, student team exercises have been used for many years at the school. One of the problems was convincing faculty that evaluating teamwork was possible and effective. Explicit goals and honest communication in the peer evaluation process (students rating themselves) have been essential to the student team exercise's success (Bazinet Interview).

Often team exercises are used in close conjunction with real life scenarios or internships (discussed in the next section). At Jacksonville State University, one team exercise is the continuous quality improvement exercise, where the team solves either a fictitious or actual problem (as identified by the student who may have encountered it in his or her career field) (Aman Interview).

At the USAF Academy, course guidance is to use student team exercises (Stubblefield Interview). Lt Col Dave

Porter, Behavioral Science Professor, considers it to be centrally important to get students to be actively involved in the class and in the course. In order to be successful at this, the students must be confident that they will be allowed to make mistakes and learn from them without jeopardizing their academic standing--teamwork requirements are therefore emphasized in most of the courses (Porter Interview).

At Air University (Air War College), student team exercises in conjunction with real life scenarios (fictitious and actual) are used extensively (Walker Interview). Likewise, at Air University (Air Command and Staff College), changes made to particular courses include refocussing the seminar (contact time) period more towards real-time application and group activities. One example is the "World War III Scenario" in which students are expected to demonstrate quality control techniques (such as process analysis flow charting, data-based decision making, etc.) and the integration of these techniques in the overall teamwork design-making process (Kucharczyk Interview).

Real Life Scenarios. As mentioned previously, many institutions are turning away from traditional lecture formats and turning toward real-time application to teach students to comprehend and apply total quality principles. These real life scenarios take several forms: from

discussion of current issues and how they apply to the material being covered in class; to real life exercises generated to provide students with the opportunity to apply their skills; to internships where students are given the opportunity to solve real problems either on or off campus.

At Jacksonville State University, for example, real life scenarios, including case studies and actual problems faced by the students in their career fields, provide a center point for instruction (Aman Interview). At Air University (Air Command and Staff College), use of real life exercises are employed extensively (such as how does the particular material relate to the individual's last job or how does the material relate to the Department of Defense). Exercise scenarios such as their fictitious WWIII scenario are also developed and used extensively (Kucharczyk Interview).

At the University of Southern Maine, real life scenarios are actively integrated into coursework in many classes. Teams are formed and used to develop solutions to open-ended problems. Tools developed in the TQM courses can be used--plus any others found by students. Here, the teacher acts as a consultant (Bazinet Interview).

At North Carolina State University, student-team term projects are used extensively in various disciplines. These projects generally involve actual process improvement for the campus, local industry, and local hospitals. The

projects involve generating real data and improvement to real processes. The emphasis is "to work in teams on real problems with real data" (Johnson Interview). Similarly, the United States Naval Academy, widely employs student team exercises incorporating real life scenarios which solve actual USNA problems. One example is an actual seawall that was built by the Navy and designed by the USNA engineering students (Beck Interview).

Integrate Quality Improvement Methods. While many institutions offer formal classes devoted specifically to quality improvement, some institutions are making efforts to integrate quality improvement instruction within various courses and throughout the curriculum. At the University of Tennessee, for instance, the MBA program integrates and teaches quality improvement methods within various courses including, teamwork building techniques, prioritizing tools, benchmarking, statistical process control, and quality function deployment. Integrating and teaching these techniques is an area of emphasis in the curriculum (Parr Interview).

At the University of Central Florida, quality improvement methods are used within various courses; including real-life problem solving techniques, teamwork building techniques, and statistical process control. Beyond the tools, benchmarking is used at all levels in the

whole department, in support of the continuous improvement emphasis (Swart Interview).

At Air University (Squadron Officer School), significant changes are being made to the general curriculum structure to diffuse quality instruction to the students. The current curriculum consists of the four topic areas: Officership, Force Employment, Leadership, and Communication Skills. Of these, Leadership is the area targeted to diffuse the TQM instruction. However, the students are expected to apply the concepts throughout the four areas. The addition of six new lesson plans plus renovation of many existing lesson plans (which already fit well into the Air Force architecture) will be accomplished and tested with the next class. Several lesson plans incorporated or modified to teach students quality concepts include: goal setting, team building, focus on leadership, mission debriefing, and measurement tools. Quality improvement tools, including Pareto charting and flow charting, are also integrated into various lesson plans. Most instruction is conducted during the first two weeks of class, which is followed by application for the remainder of the curriculum (Varn Interview).

Other Course Presentation Techniques. Some universities have tried other course development and delivery techniques to provide their students with the

ability to comprehend and apply total quality principles. At Air University (Air War College), one technique the institution has found useful is surveying the incoming class to determine which students have experience in different areas of "quality" (i.e., quality management or instruction) and then apportioning those students among the various sections to act as assistants or facilitators to the instructors (Walker Interview).

The University of Wisconsin-Stout has included a capstone course for the Quality Technology degree in which students are required to write a Quality Manual for an actual company. The manual must be based on the ISO 9000 and 9001 standards. Their knowledge of quality issues is validated by the manual and they take it with them as part of their portfolio when they graduate (Carlson Interview).

At the USAF Academy, one technique they have found useful is using the instructor more as a facilitator than as a lecturer, showing professional business TQ videos and movies (Joel Barker's Business of Paradigms and Hidden Assets, Empowering Government Workers were recommended) (Stubblefield Interview). Another technique found useful at the USAF Academy is asking students after each and every lesson two questions, "What's the most important point?" and "What's the murkiest point?". The results of these two questions form the basis of a review at the start of the next lesson (Porter Interview).

Fordham University, uses a technique called "reinforcement exercises." One such example is an exercise where students are taken to the rifle range to shoot bullets. They are then given the opportunity to try different methods to improve their shooting performance and to experience what happens when they try these different approaches. This particular exercise can be helpful in demonstrating how one can actually make a process worse--what Dr. Deming refers to as "tampering" (Orsini Interview).

The University of Southern Maine has found it useful to include the scientific method emphasizing the plan, do, check, act cycle; and the use of fishbone charts to help analyze traditional methods of evaluation. The methods of evaluation are currently being studied to determine why the education process is producing the observed results (Bazinet Interview).

Another technique used by the University of North Texas is the incorporation of large scale projects and advanced Quality Control techniques in its Quality Control course. One aspect of these projects was a paper competition funded by the American Society for Quality Control (ASQC). The subject was the application of a quality methodology in a real life scenario. The best paper won a $1,000 prize and second place won $500 (Prybutok Interview).

FEEDBACK METHODS

Measuring Student Comprehension and Application of Quality Principles. With the effort to teach students to comprehend and apply total quality principles also comes the need to evaluate how well these students are actually comprehending and applying these total quality principles. Most of the institutions have not yet instituted any formal specific methods to measure this aspect of student learning. Some institutions, however, have piloted several techniques to evaluate how well the students were comprehending and applying total quality principles.

At the USAF Academy, the Behavioral Sciences Department measures how well the students are comprehending and applying quality principles by assessing how well the students are able to work together during group tests and projects. Other measures are the traditional testing of concepts or tools presented in class (Porter Interview). A similar technique being tried by the University of Southern Maine involves traditional testing methods. Here, however, testing is done before as well as after an assigned project to compare the students' ability to use TQM tools before and after they are used in projects. The institution also provides a comment sheet on feedback forms specifically designed for quality tools (Bazinet Interview). Also at the University of Southern Maine, juniors and seniors are often hired by employers for special projects. They bring skills

to the company, evaluate the effectiveness of their own education, and still return to the university to relate their effectiveness to the other students. The school is consulted with in this process by the employer, also, to find out how proficient the employer thought the student was, and to find out if the university considers (teaches) the qualities that the employer thinks valuable (Bazinet Interview).

Air University (Squadron Officer School) uses two primary methods to measure how well students comprehend and apply total quality principles: written testing (for knowledge level) and Flight Commander Observation (for the application of quality skills). Leadership areas are evaluated in several areas including rating by classmates, field team exercises, and a final war game called "Balboa"-- an exercise where students are required to build teams, gather data, and execute war plans. Formal ratings (to include quality concepts) from Flight Commanders rate each student in "leadership" and "communication skills" at the 2, 4 and 7 week periods (Varn Interview). Similarly, Air University (Air War College), uses a final "wrap up" exercise to determine what quality principles students have learned. Quality concepts are evaluated based on Baldrige quality criteria, modified for Air Force use (Walker Interview).

At the University of Tennessee, individual written tests are used to determine knowledge and comprehension levels; major projects or "milestones" are used to determine how well the students have captured quality improvement methods. Team functionality, or how well members of the team function as a group, is also used to measure how well the students apply quality principles (Parr Interview). Finally, the University of Wisconsin-Stout Quality Technology program evaluates the writing of a capstone Quality Manual to provide a thorough evaluation of the student's ability to comprehend and apply total quality principles (Carlson Interview).

Feedback from the Students

Methodology for Obtaining Student Feedback. Most universities value the inputs from the students who have gone through or are going through their programs. Different institutions have a variety of methods for obtaining this feedback. At Clemson University, feedback from the students is obtained through end-of-course surveys, non-verbal evaluation of students' comprehension by the faculty member, by class discussion, and, in some short courses, by frequently seeking input about the pace of the course and the comprehension of what has been presented so far. The course critique consists of such questions as: "How is the instructor compared to other instructors you've had?", "How

is the course compared to others which you have had?", "How is the instructor's proficiency?" Dr. William Hendrix, Management Department Head, says that most of the responses fall into a positive or negative category. If the student feels strongly one way or the other about the instructor or the course, almost all of the other responses coincide with the single dominant factor (Hendrix Interview). The feedback allows the professor to provide immediate clarification, as needed, of course material. Also, senior exit interviews are given by the Department Head to all graduating seniors from the Food Science Department (Surak Interview). Specific areas in which student feedback is solicited at Clemson University include the specific instructor and the specific course. Questions about the specific department and the entire curriculum are asked during the senior exit interview given to all graduates of the Food Science Department (one, last year; but the average is around 8 per year) by the Department Head. The student feedback is seen by the instructor for the end of course critiques, who can keep them for his files (for use in promotion or tenure review) or discard them. The Department Head, alone, sees the exit interviews, except on a case by case basis with negative comments (Surak Interview).

At the University of Southern Maine, some instructors, at the start of each session, allocate an open time of about 15 minutes for student comments. When Professor Bazinet,

Assistant Professor of Technology, teaches over the air, he advertises a fax number and takes comments that way. Additionally, he makes an effort to highlight material suggested by students and use it as soon as possible in the class. One way to stimulate interest in this is to give credit for the ideas over the air. Dr. Bazinet, referenced Juran's Spiral of Quality, citing that ideas stimulate more ideas which increasingly change and improve the course (Bazinet Interview). Specific areas in which student feedback is solicited include the specific instructor (Does he/she cover the stated goals? Was he/she willing to listen?) and the specific course (Did it deliver what it proposed?). Feedback about the course is used as a mirror of the department's performance (Bazinet Interview).

At the University of Wisconsin-Stout, feedback is obtained from students after they return from junior year internships with industry. An active attempt is made to receive input about their experience. The students are required to give a presentation to other student groups about their work, what the company expected, and what they needed to be able to do. These presentations are an important method of reinforcing the faculty message of what is important for the students to understand. Active contact is maintained with graduates, of whom there are about 18-20 per year (Carlson Interview). At Air University (Air Command and Staff College), there are a

variety of methods used to obtain feedback from the students. This includes several survey methods. All students will fill out an end-of-phase survey (each phase consists of approximately 25 lessons). There are eight phases in the curriculum. Additionally, one student in each section is tasked to evaluate each lesson in the phase. This duty is then passed to another student at the beginning of the next phase (Kucharczyk Interview).

At Air University (Air Command and Staff College), an anonymous E-Mail system called the "TQ Hotline" is available for ongoing feedback. Students may log in anonymously to this electronic bulletin board service (BBS). The messages are read by the administrative Quality Advisor who then directs each message to the appropriate individual for a response--which is required within 72 hours. The response is then posted on the E-Mail BBS for anyone to read. It is interesting to note that, although this service is openly available to any student at any time, it is seldom used without frequent reminders from the staff (Kucharczyk Interview).

At Fordham University, feedback from the students in the Deming Scholars Program is obtained throughout each cycle through on-going interaction between faculty and students. (This type of feedback is made possible by the relatively few number of students involved in each class.) Additionally, a formal review is conducted each cycle

covering what was learned and how it was learned and includes a student self assessment. From this the faculty determines what the students have learned and what they would like to learn. This in turn is used to help design material to be taught in the next cycle. These reviews serve the dual purpose of obtaining feedback on the effectiveness of the course presentation as well as obtaining a measure of how well the students are comprehending and applying quality principles (Orsini Interview).

At North Carolina State University, daily formal feedback in several Statistics and Management courses were attempted but the instructor did not find it useful. However, an experimental course that solicits daily "fast feedback" from the students may hold more promise. The key difference here is the employment of an assistant to do a content analysis on open-ended questions. The fast feedback is seen only by the individual instructor. However, students can generally see the results of their feedback in action (Johnson Interview).

A unique form of feedback is conducted at the United States Naval Academy where a leadership/counseling critique is conducted by the freshmen class on the junior class leaders. The freshmen rate the juniors on various areas of leadership based on a 32-question survey. Any of the upper class cadets (juniors) can compare what he/she thought of

his/her performance against the subordinate's perception of him/her. An interesting point to note is that behavioral change has been observed and measured in the junior class leaders as a result of their seeing the freshman feedback (Beck Interview).

The University of Tennessee uses several feedback methods. The ones that were found to be the least effective and least useful were the numerical rating systems. They gave very little clue as to how to improve and also induced competition, which is not considered useful in this context. On the other hand, open ended questions, such as:

> What is the most important thing that you had to work on?
>
> What were some of the major deficiencies?
>
> What is the thing that you feel you still don't understand?

were found to be the most helpful. Student feedback is made available to all the MBA core faculty (Parr Interview).

Methodology for Implementing Change from the Student Feedback. Just as the methodology for obtaining student feedback varies from institution to institution, the methodology for implementing change from the feedback also differs. At the University of Southern Maine, student feedback is collated and seen by the department dean, the department chairs (who retain a copy), and, lastly, the faculty (if the feedback is unsigned, it can be discarded

here. Signed, written copies are entered into a professor's permanent record). It would take at least three to four cycles of poor feedback to remove a faculty member. Programs which have not adopted these initiatives are represented by the attitude that they are not looking for change, prior examples are still valid, the way things have been done is still the best, and they prefer to stay "out of the loop" of change (Bazinet Interview).

At Air University (Air War College), an evaluation director for the institution directs the entire feedback operations at AWC (Walker Interview). Similarly at Air University's Air Command and Staff College, the student feedback is collated by the evaluation division, and then distributed to the commandant, the vice commandant, the deans, and the course directors. Individual faculty may see the feedback if desired. Students do not generally see the results of the feedback. Changes to the curriculum or individual courses are determined subjectively and are generally made by the course directors, although, changes can be specifically directed by their superiors (Kucharczyk Interview).

Air University's Squadron Officer School, employs a slightly different process. The feedback is compiled and statistically analyzed by the evaluation directorate and then distributed to the senior leaders (Director of Curriculum, Division Chiefs, etc). A "Planning Board" then

meets and confers on the results of the feedback. One such result is a compilation of "top ten comments" which is a collection of statistically significant comments and subjectively significant comments that are considered for action (Varn Interview).

At the United States Naval Academy, student academic feedback is seen specifically by all instructors and department heads, and is available to any parties that are interested. Student feedback results in change to the curriculum or courses, at the end of each semester, through an analysis of data charts (Pareto charts derived from student inputs), which is used to develop changes to improve the course structure and classroom instruction techniques (Beck Interview).

At the USAF Academy, weekly feedback is reviewed with the students about every two to three weeks. A review of uncovered or misunderstood material is held. A discussion of the course, the student comments, and what the instructor has done, or will do about them is another important part of the exercise. The assessment is seen as a conversation between students and faculty, where the students see the role their comments play in the process and the faculty shares their decision process with the students. The students, in turn, assume more ownership of the process and make better suggestions (Porter Interview).

At the University of Central Florida, feedback from the students is obtained using two kinds of questionnaires. The first is an open-ended one used as the end-of-course critique. The other is a more structured critique with specific questions. Students are asked to rate the factors on a numerical scale. The structured questionnaire was developed by the Industrial Engineering faculty as part of an effort to use TQM to improve the instruction given in their classes. This critique was given for the first time in the spring mid-semester. The initial stimulus of the multiple critique form came in the fall semester when Ms. Maria Jimenez, a Graduate Teaching Assistant (TA), gave students in an engineering economics class frequent critiques and implemented recommendations immediately in the classroom. The student's attitudes changed dramatically, in Ms. Jimenez's opinion, positively affecting the entire nature of the course and the amount of learning which took place. She noted that the students seemed to ask more questions about the material covered in class. The students gained a sense of ownership of the process of improving the course. A group of 10 students volunteered to act as a committee to help her review comments and suggest improvements to the course (Jimenez Interview).

Feedback from the Prospective Employers

Methodology for Obtaining Employer Feedback. Most universities also value the inputs from the prospective employers of their students. Different institutions have a variety of methods for obtaining this feedback. At Jacksonville State University, feedback is solicited from the prospective employers of the graduates through a variety of ways. An annual employer survey is conducted starting one year after student graduation. Advisory committees meet periodically each semester. Industrial visits are conducted two to three times a semester. The university is also a host site for a total quality network training program conducted in conjunction with the Chamber of Commerce for business managers--the program is a three day management overview of total quality management concepts and tools. This is then followed by the managers going back into their firms and designating teams of five to seven people who return to campus one day a week every other week for 13 weeks for classroom instruction. They in turn will identify a problem related to a quality issue in their company. This has been very successful in the community and successful for providing feedback to the institute (Aman Interview).

At Clemson University, feedback is solicited from the prospective employers of the graduates by circulating syllabi to employers for their input and by soliciting ideas for case studies from corporations. That way the real life

problems worked on by the students are in the business's interests. There is also an Industrial Advisory Board with representatives from small to medium-size local companies, but the board operates more in theory than in practice (Surak Interview).

The University of Southern Maine uses a TQM advisory board which sat with a group of major regional corporate employers about 18 months ago and asked them what they were looking for in the employees they hired. The representatives emphasized that graduates should be 1) articulate, 2) proficient writers, 3) able to understand people, 4) able to "hit the ground running," 5) able to ask for help before getting in trouble, and 6) should have a liberal education background with a focus in some specific area. Getting these recommendations from the corporate representatives impressed the school's administration. They have supported the efforts to adapt the curriculum to fit these needs (Bazinet Interview).

At Air University (Squadron Officer School), feedback is solicited from the employers of the graduates using two basic methods. First, written surveys are sent out on an almost continuous basis asking supervisors and commanders to evaluate SOS graduates under their command. Second, field surveys are conducted, by regulation, every two years. SOS representatives are sent TDY for ten days to several selected bases to interview field commanders face-to-face

(Varn Interview). At Air University (Air War College), feedback from the prospective employers of the graduates is solicited via an informal and ongoing basis primarily through the use of resident representatives (called "chairs") of the gaining commands who will make recommendations on the curriculum (Walker Interview).

At the University of Tennessee, "feed-forward" (inputs for curriculum design) and feedback (how well the graduates are performing) is solicited from the prospective employers of the graduates by formal and anecdotal means. Formal written feedback on each of the graduates is obtained at the end of the graduates' internship to determine how well they performed, what are their strengths and weaknesses, etc. Verbal feedback is also solicited whenever corporate representatives visit the institution. The employer feedback is seen by core faculty and is voluntarily made available to the rest of the institution (Parr Interview).

Methodology for Implementing Change from Employer Feedback. At most institutions, the methodologies for implementing change from employer feedback did not differ significantly from the methodologies for implementing change from student feedback. A few exceptions were noted. At Air University (Air War College), implementing change from employer feedback is done through a variety of methods

including informal contacts between people, numerous briefings, and curriculum meetings. (Walker Interview).

At the University of Southern Maine, employer feedback results in change to the curriculum or courses through the curriculum committee's and faculty's review and consideration of the feedback. The decision to make any changes still rests with the responsible faculty. A course's syllabus must be submitted annually to the Provost (chief academic officer), who, along with the faculty member, must balance whether the course fits the curriculum's goals versus the faculty member's academic freedom to create his/her own course (Bazinet Interview).

Changes in Employer Satisfaction. Most universities that have implemented total quality education programs and that have various methods of obtaining employer feedback, have also noticed changes in employer satisfaction with their universities. At the University of Southern Maine, there have been significant changes in employer satisfaction with the university and with the students. Recent graduates have been very well-placed due to their superior ability to work with other people on technical projects. Rather than being used as entry level engineers, for example, they are put in positions of organizing people and articulating the goals of the organization because they have demonstrated the ability to do so. The graduates

"number one advantage" is the level of their communication skills. They have learned--as a result of the TQM innovations in their curriculum--teamwork, two way communication (including an ability to accept criticism), and they understand their responsibility to defend the people working for them (Bazinet Interview).

At Jacksonville State University, changes in employer satisfaction with the university and their graduates has been positive. The Chamber of Commerce now asks representatives from the Department of Technology to speak with prospective companies that are considering locating in the area. Likewise, Department of Technology representatives are continuously asked to speak to different industrial and professional groups. Post-graduate employment has improved. Within two years, unsolicited phone calls from companies seeking graduates have gone from near zero to more than the number of students that are graduating--in short, the Department of Technology is turning employers away. A dramatic increase in enrollment has also occurred (143 to 207 in the Technology Department) (Aman Interview).

At Clemson University, changes in employer satisfaction with the university have been noticed, including a donation of software valued at $100,000, which is believed to be directly related to the performance of graduates employed at the company (Hendrix Interview).

STRENGTHS AND DEFICIENCIES

To assess some of the strengths and deficiencies of these educational processes, the interview respondents were asked to comment on what they perceived to be their institution's successes, disappointments, and roadblocks encountered in implementing total quality education initiatives. Respondents were also asked to comment on any improvements they would like to make to improve their programs. The following section discusses some of the results of these questions.

Strengths and Successes

Improved Student Attitude. Many of the institutions surveyed noted improved student attitudes toward learning. One improvement was the acceptance and ownership of the students of the learning process. At the University of Central Florida, for instance, the institution was able to show some reluctant or cynical students that the critiques could produce changes (Jimenez Interview). Similarly, at the United States Naval Academy, the process action teams allow the sophomore students to actually make system changes that affect the way the school is run (Beck Interview). And, in the Behavioral Science Department at the USAF Academy, the establishment of a climate of continuous improvement has resulted in the faculty and

students taking great pride in their work. Growing numbers of students have been attracted to the majors offered by the department despite the increasing requirements for acceptance (Porter Interview). Additionally, at the USAF Academy, LtCol Stubblefield, Director of Quality Assistance, has noticed a definite decline of the traditional "I dare you to teach me something" attitude of the students (Stubblefield Interview).

Another improvement observed by several institutions was that the students enrolled in quality oriented education programs tend to apply themselves more, academically. According to Mr. Surak, of Clemson University, an experiment with removing the grading process from the students (giving them all A's) and by moving issues into discussion (away from lecture), the students were forced to keep up, do the reading, apply, and think in class (Surak Interview). Likewise, the University of Tennessee reports that their greatest success has been with the student's ability to creatively work together and to apply principles in an "integrated" way (Parr Interview).

Improved Community Satisfaction. As noted previously, many institutions reported improved employer satisfaction with the institutions' graduates. Several institutions have also noticed increased community interest and appreciation for their programs, both on and off campus.

At North Carolina State University, the greatest success with efforts to enable students to comprehend and apply total quality principles has been the real projects done by students in teams. As a result, the Chancellor has taken the lead to further TQM education initiatives for the entire Campus (Johnson Interview). The University of Southern Maine reported improved levels of graduate employment, both in a high rate of employment and in the positions of responsibility they have earned. This was accompanied by new-found support from many other sources, including Dr. Juran, the ASQC, and Federal Express (a Malcolm Baldrige winner and major local employer) (Bazinet Interview).

Deficiencies--Roadblocks and Disappointments

Lack of Infrastructure Support. The chief roadblock reported by many universities was lack of support from the institutional infrastructure (both administratively and within the faculty) for the new quality education initiatives. This roadblock was noted by Air University (Air Command and Staff College), which reports a perceived lack of support from the senior leadership, both within the Air University and throughout the Air Force, for true quality education initiatives--in short, there is the perception that "the structure supports quality education, but the people do not." This perception that quality is being forced and not supported, in turn, leads to

preconceived prejudices against quality initiatives. (Kucharczyk Interview). Likewise, the Squadron Officer School at Air University also reports a prevailing perception that, while the implementation of "quality education" has been directed by the Air Force staff, it is not actively and properly supported from upper levels (Varn Interview).

At the United States Naval Academy, similar roadblocks were encountered including alignment of the new changes throughout the system. Specifically, thought processes and goals differ among the junior and senior management--this is attributed to, essentially, a communication problem (Beck Interview). Similarly, the United States Air Force Academy reported difficulty in convincing everyone (administration and faculty) of the need for quality education training (Stubblefield Interview).

Clemson University comments that the slow-moving bureaucracy in the curriculum revision process impedes the rate of change possible (Hendrix and Surak Interviews). The University of Vermont reports that there is a perception that TQM is "soft stuff" and not appropriate for the sciences (Haugh Interview). At the University of Central Florida, reluctance to change was a powerful obstacle to overcome in implementing the Industrial Engineering project consisting of new survey forms and a commitment to continuous improvement based on feedback. One instructor,

commenting on the inertia, stated: "If the instructor won't buy it, how will the student?" (Jimenez Interview).

At the University of Tennessee, William Parr, Director of the Center for Advancement of Organizational Effectiveness, reported similar roadblocks including some lack of administrative infrastructure support (to parallel initiatives made by the faculty). However, faculty support is very good. In summary, Mr. Parr made an interesting point--he said that it is important for an institution to ask: "Why would anyone want to do a program like this?" In other words, the time-intensive nature of the work involved to create effective change and the fact that these measures do not provide a "quick fix" solution are issues that must be addressed before [emphasis added] an institution attempts to embark on a program of this nature (Parr Interview).

Lack of Time, Money and Materials. Another common complaint made by several institutions is the lack of adequate resources to provide students with a complete education. At Air University (Squadron Officer School), roadblocks encountered include the time required to implement changes coupled with the prevailing perception that, while the implementation of "quality education" has been directed by Air Force staff, it is not actively and properly supported from upper levels (Varn Interview). At Clemson University, roadblocks encountered include the lack

of funds to buy material, the entire budget process, and a slow-moving bureaucracy in the curriculum revision process (Hendrix Interview).

Another resource in high demand is adequate manpower. One problem that the United States Air Force Academy faces is a reduction in students corresponding to the downsizing of the officer corps. The manpower allocations for faculty are based on student numbers, and so the number of instructors are also cut. The problem is that, while the teacher-student ratio is maintained, the ability to teach diverse courses is reduced. Course proliferation is a major concern and there are very real limits to the number of courses that can be offered (Porter Interview). The University of Southern Maine reports the problems that there is not enough time to teach more students and that there are not enough instructors willing to teach the concepts (Bazinet Interview).

Lack of Student Appreciation for the New Program. Another complaint made by several universities is that the students often do not fully appreciate or understand the initiatives made to teach them to comprehend and apply total quality principles. At Clemson University, Professor John Surak relates that the greatest disappointment with his efforts to enable students to comprehend and apply quality principles was that the students didn't like his plan. They

thought it was too much work (Surak Interview). Clemson also reported difficulty in changing the basic attitude of students to accept responsibility for their own education, and to adopt the attributes of integrity, honesty, and self-discipline (Hendrix Interview).

At the University of North Texas, similar roadblocks encountered include some students' desire to have a more structured (familiar) course (Prybutok Interview). And at the University of Central Florida, Graduate TA Marie Jimenez relates that one of her greatest disappointments with efforts to teach students to comprehend and apply quality principles came when it was apparent, on the last student survey, that some students never understood what she was trying to do (Jimenez Interview).

Lack of Incoming Student Skills. Another problem related by several universities is that incoming students are not adequately prepared to undertake the more rigorous programs offered by these institutions. At the University of Wisconsin-Stout, Quality Technology Professor Wallace Carlson reports that the major roadblock he has encountered is that incoming students possess inadequate skills to meet the demands of the course and industry. Specifically, they are not able to successfully apply quantitative techniques and communicate them appropriately. Many students cannot write technical reports. Therefore, extra time must be

spent on what he considers remedial education (Carlson Interview). Similarly at Fordham University, students are not adequately equipped in quality principles prior to arrival at the Deming Scholars Program--a lot of rework is therefore required to bring the students up to a level appropriate for the material being covered (Orsini Interview).

Ineffective or Impractical Processes. Interview respondents were asked to comment on initiatives that they had found to be ineffective or impractical. Several institutions reported ineffective processes that centered on large groups, which provided inadequate student-teacher interaction. Air University (Air Command and Staff College), for instance, found mass lectures to be ineffective--in general, these lectures were found to be uninspirational (Kucharczyk Interview). At the University of Southern Maine, one process found to be ineffective or impractical was teaching statistical process control by way of video presentation. That was difficult without the feedback of being physically present with the students to gauge their understanding (Bazinet Interview). The University of North Texas found large student teams/projects in large classes too difficult to properly manage (Prybutok Interview). And, at Clemson University, processes that were found to be ineffective or impractical included paper and

pencil team-building exercises, as opposed to real-life scenarios (Hendrix Interview).

At the University of Tennessee, one process found to be ineffective or impractical is "preaching" quality principles to the students. Also, it is been found more effective to present the challenge to the students before instructing the methodology, rather than to instruct methodology first and then give them the challenge. This sequence has been found to provide students with a greater appreciation for, and a better ability to retain, the methodologies (Parr Interview).

Other institutions related administrative processes that they found ineffective or impractical. The University of Central Florida found its original efforts to adopt an industry-oriented TQM process into the academic environment ineffective. It proved to be very difficult to match industry processes without major modifications, which in turn led to frustration. That program was TQC (total quality control) and was introduced by a faculty member who also worked as an industry consultant (Jimenez Interview). Similarly, the United States Air Force Academy found that bringing in outside help (consultants) caused difficulties. The consultants stimulated an immediate distrust and emotion, characterized by the attitude of "this guy doesn't know what I'm doing, so he can't help" (Stubblefield Interview).

Further Improvements Desired. Respondents were also asked what further improvements they would like to make to enable their students to better comprehend and apply total quality principles in their fields of study. Some suggested improvements centered on the need to more clearly define, for the student, what quality means to employers and society, in general. For instance, at the University of Southern Maine, Dr. Bazinet, Assistant Professor of Technology, would like to invite business leaders to appear in seminars where the students get to interact with them and ask directly if what is being taught to them will be useful in the employer's company (Bazinet Interview).

At the University of Wisconsin-Stout, Mr. Carlson, Professor of Quality Technology, would like to improve the level of agreement within industry and society in general concerning exactly what standards they really want to adopt. That way, if the standards are consistent, the educational institutions, as a whole, can do a better job preparing their students (Carlson Interview). And Dr. William H. Hendrix, Head of the Management Department at Clemson University, would like to update teaching aids, obtain a more globally-oriented text for the classes, and bring in additional expert speakers concerning the ISO 9000 standards and the criteria for the Malcolm Baldrige Award (Hendrix Interview).

Other suggested improvements convey the need for greater involvement of the campus administration and faculty in the quality education process. At Air University (Air Command and Staff College), for instance, Maj Kucharczyk, (Chief, Command Studies Branch Curriculum Development) expressed the need to obtain greater support from the leadership (on and off campus) for quality education initiatives. These quality education processes should be expanded throughout the curriculum. Additionally, these initiatives should not have to be subversive, but rather, openly supported (Kucharczyk Interview). Similarly, at Jacksonville State University, Dr. Aman (Head of the Department of Technology) would like to make the Technology Department's continuous quality improvement course a core requirement for every student on campus (Aman Interview). Likewise, University of Central Florida graduate TA, Marie Jimenez, would like to have the entire school follow the Industrial Engineering Department by adopting similar total quality education initiatives (Jimenez Interview).

Other suggested improvements center on changing specific educational processes. At the USAF Academy, further improvements that Lt Col Stubblefield (Director of Quality Assistance) would like to make to enable students to comprehend and apply quality principles include adding more courses for the most motivated faculty and staff/quality students, especially in planning, benchmarking, and metrics

(Stubblefield Interview). At Clemson University, Professor John Surak, would like to incorporate methodologies for providing two sides to each issue, letting the students debate and evaluate the merits of each side (Surak Interview). Further improvements that University of North Texas Director (Center for Quality and Productivity), Victor Prybutok, would like to make include further refining the team process and conducting large, on-going projects for the students which don't necessarily end neatly at the end of the course (Prybutok Interview). And finally, at the University of Tennessee, further improvements that William Parr (Director of the Center for Advancement of Organizational Effectiveness) would like to make to enable students to comprehend and apply quality principles include integrating quality-oriented material further within the curriculum and to apply closer links with technology (e.g. inviting Apple Computer to discuss how to apply some very high tech educational technologies) (Parr Interview).

SUMMARY

The educational processes of curriculum development, course construction and delivery, and feedback methods were examined at various institutions. Strengths and deficiencies (as observed by these institutions) were also examined. The innovations and techniques in these processes, which were highlighted in these interviews, are

examples of the efforts developed by various civilian and military universities to enable their students to comprehend and apply total quality principles. The compilation of processes summarized in these findings should facilitate the efforts of DoD institutions seeking to adopt similar total quality education programs.

V. CONCLUSION

SUMMARY AND ANALYSIS OF FINDINGS

Various civilian and military institutions were examined to determine what educational processes they used to provide their students with the ability to comprehend and apply total quality principles within their fields of study. Areas of interest included curriculum development, course development and delivery, and feedback methods. The strengths and deficiencies of these processes (as observed by the individual institutions) were also examined.

In the area of curriculum development most institutions offered formal classes in quality improvement. Those that did not, generally tried to diffuse total quality training throughout the curriculum. While most institutions provided some form of guidance (formal or informal) for curriculum construction and content, very few actually enumerated requirements that provided specific guidelines for teaching students to comprehend and apply total quality principles. One curriculum development process found in virtually all of the institutions was the departure from the more traditional class lecture formats to relying more heavily on real-time application, either through internships, or through real life scenarios. Some of these institutions are also departing from traditional individual class formats and turning to continuous lesson based formats. Cross-

discipline or multi-discipline courses were also generally the rule at most of these institutions. Many universities are also making efforts to incorporate greater student participation in curriculum and course development, although there seemed to be mixed enthusiasm with these efforts.

Many institutions have made changes to their individual course development and delivery processes as well. Most of these institutions regularly invite prospective employers to speak to the students to relate their expectations of future employees. Another common technique used by these institutions is team teaching--inviting instructors from the same or different disciplines to teach various lessons. This is often done to provide students with alternative viewpoints of the issues being discussed. Some institutions are incorporating lesson plans developed by prospective employers within their own lesson plans, although this technique is used only cautiously by other institutions. Virtually all of the institutions interviewed employed various forms of group discussion techniques as well as student team exercises. Real life scenarios offered within various courses was also quite common. These real life scenarios ranged from discussion of current issues and how they apply to the material being covered in class, to exercises generated in order to provide students with the opportunity to apply their skills, to university-wide instituted internships. Many institutions, in addition to

offering formal classes devoted specifically to quality improvement, are also making efforts to integrate quality improvement instruction within various courses and throughout the curriculum.

Different institutions employed various feedback methods to assess the effectiveness of their educational initiatives. Few institutions appeared to have effective methods established for specifically measuring how well the students were actually comprehending and applying total quality principles. Innovations in this area generally encompassed evaluation of group projects and real life scenarios, sometimes coupled with the formalized, pre-established grading criteria such as Baldrige Award criteria. The process of obtaining feedback from the students varied dramatically among institutions--ranging from daily critiques, to formalized end-of-course evaluations, to town meetings involving university faculty and students. Likewise, the process of obtaining feedback from the prospective employers also varied substantially from institution to institution. Some institutions sent out periodic written surveys, others sent project teams to visit prospective employers, while others had representatives (full or part time) on the campus staff.

Strengths and deficiencies of these educational processes as observed by these institutions were also examined. Many universities noted improved student

attitudes toward learning, improved employer satisfaction, and increased interest in the initiatives throughout the campus and community. Some of the roadblocks and disappointments that were noted include a lack of infrastructure support, a lack of adequate resources (time, money, materials and manpower), a lack of student appreciation for the new programs, and a lack of incoming student skills. Some of the processes attempted by these institutions that were found to be ineffective or impractical include those centered on large groups that provided inadequate student-teacher interaction, and "preaching" quality principles to the students, as opposed to actively employing them in the educational environment. Some suggested improvements made by the respondents include: the need to more clearly define for the student what quality means to employers and society in general; greater involvement of the campus administration and faculty in the quality education process; and, adding more quality oriented courses for motivated students.

PRACTICAL IMPLICATIONS FOR THE DoD

Most of the processes observed at these institutions seem highly appropriate for use by the Department of Defense. In fact, several of the DoD institutions interviewed were front runners in implementing educational processes to teach students to comprehend and apply total

quality principles. Two advantages that DoD institutions have over their civilian counterparts are the ability to direct the use of certain processes on a wide scale basis and the ability to exercise authority over their students outside of the classroom environment. One chief disadvantage of the DoD is that they are limited by law concerning their use of resources, curriculum content, and manpower.

It is important to note that no claim should be made that the processes observed in this study are complete and indisputable. In fact, new processes are constantly being tried by these universities, as well as others. It is also important to note that the processes observed at these institutions have yet to be independently tested. The processes observed can, however, provide a useful footing and valuable guidance to those DoD institutions seeking to provide their students with the ability to comprehend and apply total quality principles.

RECOMMENDATIONS FOR FURTHER RESEARCH

While every attempt was made to examine a diversity of institutions with innovative processes, there were certainly leading institutions that were overlooked in the research process. Future research should continue to explore other universities and to examine in more detail the processes already investigated in this research. This research also

failed to adequately identify and independently measure the strengths and deficiencies of these programs across university lines. Further research that develops a methodology to independently and objectively evaluate the effectiveness of various university processes in providing their students with the ability to comprehend and apply total quality principles, would provide an excellent follow on to this research.

CONCLUSION

While there are questions about total quality in education, summarizing and publishing some of the experiences of those faculty and institutions putting the theory into practice is hoped to be a valuable tool to those looking for assistance. The wealth of ideas flowing out of the academic environment means that the subject is changing continuously and rapidly. The possibility of adding far more examples, with far more detail, which will go even farther towards helping students comprehend and apply the powerful total quality concepts and tools, is a strong incentive for further research in this area. It is the hope of this research team that efforts in developing effective processes for enabling students to comprehend and apply total quality principles will continue.

APPENDIX A

TELEPHONE SURVEY QUESTIONNAIRE

TELEPHONE SURVEY QUESTIONNAIRE

NAME: _____

SCHOOL: _____

POSITION: _____

PHONE: _____ **OFFICE HOURS:** _____

INTERVIEWER INTRODUCTION: The purpose of this survey is to collect data on quality education programs initiated by various university level institutions. The data will be used to determine common strengths and weaknesses associated with providing students with the ability to comprehend and apply quality principles within their fields of study.

Although we have attempted to write the questions so that they can be answered directly and briefly, please feel free to add any comments you think might benefit other institutions attempting to implement total quality education programs.

This interview is designed to last approximately 30 minutes. If we run out of time and can't complete the interview in one sitting, please let me know. I would be happy to continue the interview with you at some other time that is convenient.

PERMISSION TO TAPE INTERVIEW: In order to facilitate data collection, I would like to tape this conversation. However, if you desire, any or all of your comments can be kept anonymous. Is it all right with you if I tape our conversation? I would also assure you that before attributing any comment to a person or university, I will obtain permission from you or the appropriate authority.

(italics--interviewer notes)

This survey is divided into four major sections:
1. Overall *curriculum* development.
2. Individual *course* development and delivery.
3. Feedback methods.
4. General wrap-up questions.

SECTION 1

THE FIRST QUESTIONS ADDRESS *GENERAL CURRICULUM* DEVELOPMENT:
(Pleases remember, questions about *individual course* development and delivery will be asked later, in section 2)

1. Does your school offer a formal class (or classes) specifically dealing with Quality Improvement concepts such as TQM, Continuous Improvement, etc.? (Y/N):

   a. Is it a mandatory/core course?

   b. Does it focus on a particular advocate or approach (e.g. Deming, Crosby, TQM, Continuous Improvement)?

2. Does your institution have any formal or informal guidance for curriculum construction and content? (Y/N):

   a. Does this guidance contain specific considerations for teaching students how to comprehend or apply total quality principles? (If so, what are the highlights?)

   b. If yes to "a" above, may we have a copy of that guidance?

3. What changes have you (either personally or institutionally) made to the general curriculum structure to teach students how to apply total quality principles?

4. Have any specific departments or disciplines adopted Quality education initiatives more than others? What are the results?

5. Do you have any cross-discipline or multi-discipline courses?

6. What guidelines do you have, if any, to teach across disciplines or offer multi-disciplinary courses?

7. To what degree do students participate in general curriculum or program development? *(Please remember, questions about specific courses will be asked later)*

8. What guidelines do you have, if any, for regulating student workload?

SECTION 2

THE FOLLOWING QUESTIONS ADDRESS *INDIVIDUAL COURSE* DEVELOPMENT AND DELIVERY

9. What changes have you (either personally or institutionally) made to any particular course or courses to teach students how to apply quality principles?

10. Have you (personally or institutionally) used any one or a combination of the following methods to teach students total quality principles? (Feel free to comment) *(Check the ones that apply)*:

____ Do you invite outside employers (business leaders, CEOs) to talk to the students?

____ Do you use team teaching (which we define here as: sharing teaching duties with another instructor from the same department)?

____ Do you invite instructors from other disciplines or departments to teach?

____ Do you employ group discussion techniques?

____ Do you use or incorporate lesson plans developed by prospective employers?

____ Do you use student team exercises?

____ Do you use real life scenarios?

____ Do you integrate and teach quality improvement methods within various courses? (Examples of quality improvement methods include: real life problem solving techniques, benchmarking, teamwork building techniques, statistical process control, etc.)

____ Have you used any other technique that you feel has been beneficial in helping your students comprehend and apply total quality principles in their fields of study?

11. Have any specific courses adopted Quality education initiatives more than others? Why? What are the results?

12. To what degree do students participate in course development?

SECTION 3
THE FOLLOWING QUESTIONS ADDRESS FEEDBACK METHODS:

13. Do you attempt to obtain feedback from the students? (Y/N)

a. How?

b. In what specific areas do you or your institution solicit student feedback? (*Check the ones that apply*):

____ a specific instructor
____ a specific course
____ a specific department
____ the entire curriculum
____ the university educational environment
____ other (please specify):

c. When and how often is student feedback solicited?

d. Who sees the student feedback?

e. How does the student feedback result in change to the curriculum?

f. How does the student feedback result in change to individual courses?

g. Does the student see the result of the feedback? How?

14. Do you have any specific methods to measure how well the students are comprehending and applying quality principles within their fields of study? What are these measures?

15. Do you attempt to obtain feedback from the prospective employers of your graduates? (Y/N)

a. How do you obtain feedback from employers?

b. When and how often is employer feedback solicited?

c. Who sees the employer feedback?

d. How does the employer feedback result in change to the curriculum?

e. How does the employer feedback result in change to individual courses?

16. Have you noticed any changes in employer satisfaction with your university? With your students?

SECTION 4
THE FOLLOWING QUESTIONS ADDRESS FINAL ISSUES AND WRAP UP:

17. What is your greatest success with your efforts to enable students to comprehend and apply total quality principles in their fields of study?

18. What is your greatest disappointment with your efforts to enable students to comprehend and apply total quality principles?

19. What roadblocks have you encountered in your efforts to enable students to comprehend and apply total quality principles?

20. Are there any processes that you found in your efforts to enable students to comprehend or apply total quality principles which were ineffective or impractical?

21. What further improvements would you like to make to enable students to comprehend and apply total quality principles in their fields of study?

22. Are there any questions which you feel I should have asked you, but failed to do so?

23. Do you know of anyone else who would be a good candidate to interview?

NAME: _____

SCHOOL: _____

POSITION: _____

PHONE: _____ OFFICE HOURS: _____

NOTE OF APPRECIATION: Your effort in completing this survey is greatly appreciated. If you would like, we would be happy to send you a copy of the results of this research once it is completed. If you would like to add any comments later on, please feel free to contact me or my research partner by any of the methods listed below. Thank you for your time.

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APPENDIX B

TELEPHONE INTERVIEW SUMMARIES

The following appendix contains interview summaries by the individual respondents. The surveys are listed alphabetically, first by institution and then by the last name of the respondent.

TELEPHONE SURVEY SUMMARY

NAME: Maj Barbara A Kucharczyk

SCHOOL: Air University: Air Command and Staff College

POSITION: Chief, Command Studies Branch Curriculum Development

PHONE: (205) 953-2487 DSN: 493-2487

DATE: 14 May 93 TIME: 0800-1010 (EST)

INTERVIEWER: Bond

CURRICULUM DEVELOPMENT

The school offers formal classes specifically dealing with Quality Improvement concepts such as TQM. They are mandatory for all students. The courses do not focus on a particular advocate or approach (e.g. Deming, Crosby, TQM, Continuous Improvement). However the courses do focus on QAF (Quality Air Force) principles as directed by the Chief of Staff of the Air Force--these are specified in 14 subject areas:

Quality Principles
Quality Air Force
Customer Focus
Process Management
Basic Tools
Management Tools
Metrics/Measurement
Statistics
Team Dynamics
Interpersonal Skills
Quality Leadership
Strategic Planning
Assessment
Special Tools

These 14 subject areas constitute informal guidance for curriculum content but do not contain specific considerations for teaching students how to comprehend or apply total quality principles.

Changes to the general curriculum structure to teach students how to apply total quality principles include an overall reduction of contact (classroom seminar) time from 5

hours per day to 3 hours per day. There is also a much greater emphasis on group activities.

The basic course structure is divided into three areas:

1. Student Self Study--read the assigned material
2. Seminar Discussion on how the material relates to their particular job or to the Air Force as a whole.
3. Research Time

The Core Lessons at ACSC include:

Military Officership and Interpersonal Skills
Group Dynamics
Process Dynamics
Quality Metrics
Management with Quality Tools
Strategic Planning

Each core lesson is designed to have an application phase and will vary from lesson to lesson.

While some specific departments or disciplines at ACSC have adopted quality education initiatives more than others, there are as yet no specific results.

Since all students take the same curriculum at ACSC there are no actual cross-discipline or multi-discipline courses offered. However, there is emphasis to relate subject material to the wide range of disciplines in the Air Force.

The guidelines to teach across disciplines or offer multi-disciplinary subject material is informal guidance that has originated from verbal directives from the Commandant of AU. The general curriculum centers around the integration of the following subject material:

1. Theory and Doctrine
2. History
3. Roles and Mission
4. Quality

Students do not actively participate in general curriculum or program development.

Guidelines for regulating student workload--very intense workload: three contact hours a day followed by five to seven hours of self study followed by several (unspecified) hours of research. Expected workload on an average day exceeds fifteen hours, with over 200 pages of required reading.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular course or courses to teach students how to apply quality principles include refocussing the seminar (contact time) period to application and more group activities. One example is the "World War III Scenario" in which students are expected to demonstrate quality techniques (such as process analysis flow charting, data based decision making, etc.) and the integration of these techniques in the overall teamwork decision-making process.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They invite outside employers (including military commanders and civilian business leaders) to talk to the students; however, a significant reduction is planned in the number of lectures overall.

Team teaching with other instructors is employed to provide different viewpoints and exposure to different disciplines.

Group discussion techniques and student team exercises are employed extensively.

Use of real life exercises are employed extensively (such as how does the particular material relate to the individuals last job or how does the material relate to the Department of Defense?). Exercise scenarios such as the WW III scenario are also developed and used extensively.

Quality improvement methods (including real life problem solving techniques and teamwork building techniques) are integrated and taught within various courses. This however is done "subversively" since there is no formal curriculum guidance directing their use and since the administrative and academic infrastructure is not yet focused on integrating these techniques. Currently Maj Kucharczyk personally trains the faculty members on techniques to incorporate quality into the lessons.

Students do not generally participate in course/lesson development. The one exception is the "Quality Elective" (a 16-hour lesson devoted to practical quality application) in which the students themselves establish goals and expectations.

FEEDBACK METHODS

There are a variety of methods used to obtain feedback from the students. This includes several survey methods. All students will fill out an end of phase survey (each phase consists of approximately 25 lessons). There are eight phases in the curriculum. Additionally one student in

each section is tasked to evaluate each lesson in the phase. This duty is then passed to another student at the beginning of the next phase.

An anonymous E-Mail system called the "TQ Hotline" is available for ongoing feedback. Students may log in anonymously to this electronic bulletin board service. The messages are read by the administrative Quality Advisor who then directs them to the appropriate individuals for a response--which is required within 72 hours. The response is then posted on the E-Mail BBS for anyone to read. It is interesting to note, that, although this service is openly available to any student at any time, it is seldom used without frequent reminders from the staff.

Specific areas in which student feedback is solicited include: the specific lesson, the entire curriculum, the university educational environment to include such things as reading materials, films, guest lecturers, and their wellness program.

Formal student feedback is solicited daily from one student in each section, and from all students at the end of each phase and at the end of the curriculum.

The student feedback is collated by the by the evaluation division, and then distributed to the commandant, the vice commandant, the deans and the course directors. Individual faculty may see the feedback if desired. Students do not generally see the results of the feedback. Changes to the curriculum or individual courses are determined subjectively and are generally made by the course directors, although changes can be specifically directed by their superiors.

There are currently no <u>specific</u> methods to measure how well the students are comprehending and applying quality principles within their fields of study.

There are no current measures to obtain feedback from the prospective employers of the graduates. This is due in part to the "failure to identify the customer". Maj Kucharczyk recommends soliciting feedback from the Air Component commanders, the MAJCOM (major command) commanders, sister services and DoD Civilian services.

GENERAL ISSUES

According to Maj Kucharczyk, the greatest success with the institution's efforts to enable students to comprehend

and apply total quality principles is the new curriculum structure.

The greatest disappointment with efforts to enable students to comprehend and apply total quality principles is a perceived lack of support from the senior leadership, both within the Air University and throughout the Air Force, for true quality education initiatives. In short "the structure supports quality education, but the people do not."

Other roadblocks include the perception that quality is being forced and not supported which in turn leads to the preconceived prejudices against quality initiatives. Processes found in efforts to enable students to comprehend or apply total quality principles which were ineffective or impractical were the mass lectures--in general these lectures were uninspirational.

Further improvements that Maj Kucharczyk would like to make to enable students to comprehend and apply total quality principles in their fields of study include obtaining greater support from the leadership. The quality portion should be expanded throughout the curriculum (these initiatives should not have to be subversive).

TELEPHONE SURVEY SUMMARY

NAME: Lt. Col. David C. Walker

SCHOOL: Air University: Air War College

POSITION: Director Quality Air Force Instruction

PHONE: (205) 953-2386 DSN: 493-2386

DATE: 21 May 1993 TIME: 0915(EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement concepts are offered with 47 core contact hours devoted to "quality education." The classes focus on the "Quality Air Force" approach (the Air Force version of Total Quality Management).

The institution has been directed at the Air Force level to incorporate more quality training into the curriculum. The current informal guidance for curriculum construction and content contains specific considerations for teaching students how to comprehend and apply total quality principles. This guidance specifically tasks AWC to teach individual students quality principles by structuring 14 points into the architecture:

Quality Principles
Quality Air Force
Customer Focus
Process Management
Basic Tools
Management Tools
Metrics/Measurement
Statistics
Team Dynamics
Interpersonal Skills
Quality Leadership
Strategic Planning
Assessment
Special Tools/Techniques

The goal is for future Air War College students to graduate with an "application" or "sustain and enhance" level of learning for most of these quality subjects. This will be predicated on the assumption that future officers

will have a "comprehension" or better level of learning in most of these areas (which they will have received during previous Air Force training). These Air Force-wide goals will soon be formalized in the pending publication of the Quality Air Force Handbook which is designed to outline the quality education an individual will receive from initial indoctrination throughout the entire career.

The general curriculum structure has been expanded from providing seven hours of basic quality concepts instruction to a building block approach consisting of 47 core hours, integrating quality into the first two trimesters as follows:

First Trimester: 24 hours introduction to QAF
Second Trimester: 23 hours senior leadership
Third Trimester: 20 hours option

Of the three departments at the AWC (National Security Studies, Regional Warfare Studies, and Military Studies), the National Security Studies Department has been specifically tasked to provide the instruction in quality concepts. Since this is a brand new curriculum, the results of the changes have yet to be observed.

The institution does not offer cross-discipline or multi-discipline courses per se, since all students for the first two trimesters receive the same curriculum.

Students participate in general curriculum or program development only through the post course feedback surveys.

Guidelines for regulating student workload are 3 to 4 hours per day of contact time which is composed on the average of 30% lecture and 70% active seminar. Reading workload consists of an average of 30,000 words per night. Writing workload consists of an aggregate of 100 written pages per year.

COURSE DEVELOPMENT AND DELIVERY

The institution employs the following methods to help students to comprehend and apply total quality principles:

They invite outside employers (including military commanders and civilian business leaders) to talk to the students.

They invite instructors from different disciplines or backgrounds to teach.

Extensive use of group discussion techniques are made in the seminar periods.

Lesson plans developed by prospective employers, such as operational readiness inspection (ORI) plans, are incorporated into the school lesson plans.

Student team exercises and real life scenarios (fictitious and actual) are used extensively.

Quality improvement methods including real life problem solving techniques, benchmarking, teamwork building techniques are integrated within various lesson plans.

Another technique the institution has found useful is surveying the incoming class to determine which students have experience in different areas of "quality" (i.e., quality management or instruction) and then apportioning those students among the various sections to act as assistants or facilitators to the instructors.

FEEDBACK METHODS

An evaluation director for the institution directs the entire feedback operations at AWC.

Feedback from the students is obtained using a variety of methods including formal end of seminar critiques and an ongoing "Valentine" system (anonymous comment forms that go directly to the commandant). Post graduate surveys are also conducted two years after graduation to ascertain the applicability of their education to the current job.

The institution does employ specific methods to measure how well the students are comprehending and applying quality principles within their fields of study. The most notable method is the final "wrap up" exercise in which students demonstrate what they have learned. Quality concepts are evaluated based on Malcolm Baldrige Quality criteria modified for Air Force use.

Feedback from the prospective employers of the graduates is solicited via an informal and ongoing basis primarily through the use of resident representatives (called "chairs") of the gaining commands who will make recommendations on the curriculum. Implementing change from this feedback is done through a variety of methods including informal contacts between people, numerous briefings, and curriculum meetings. School wide details of feedback methods were not in Lieutenant Colonel Walker's expertise.

GENERAL ISSUES

According to Lieutenant Colonel Walker, the greatest success with the institution's efforts to enable students to

comprehend and apply quality principles has been the hard hitting curriculum that is devoted to quality education.

There have been no significant disappointments or roadblocks encountered, although the results of the new program have yet to be observed.

TELEPHONE SURVEY SUMMARY

NAME: Lt Col George L. Varn

SCHOOL: Air University: Squadron Officer School

POSITION: Director, Quality Education

PHONE: (205) 953-2549 DSN: 493-2549

DATE: 19 May 1993 TIME: 0900 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

Currently two formal classes, one lecture and one seminar in "TQ Awareness," are part of the core curriculum for all students. These courses survey several approaches including Deming, Crosby, and Juran. Future plans call for dry running new lesson plans including "quality tools" with the next incoming class.

The institution does have informal guidance directed from the Air Force level to incorporate more quality training into the curriculum. The current informal guidance for curriculum construction and content contains specific considerations for teaching students how to comprehend and apply total quality principles. This guidance specifically tasks SOS to teach individual students quality principles by structuring 14 subject areas into the architecture. This "Quality Air Force Architecture" contains the following 14 subject areas or "points":

Quality Principles
Quality Air Force
Customer Focus
Process Management
Basic Tools
Management Tools
Metrics/Measurement
Statistics
Team Dynamics
Interpersonal Skills
Quality Leadership
Strategic Planning
Assessment
Special Tools/Techniques

The goal is for future Squadron Officer School students to graduate with a "comprehension" or "application" level of learning for most of the quality subjects. Guidance for providing education in quality principles is also formalized in general in AFM 50-62, which is further specified in two Squadron Officer School regulations.

Some changes have been made to the general curriculum structure to teach students how to apply total quality principles. The current curriculum consists of the four topic areas: Officership, Force Employment, Leadership, and Communication Skills. Of these, Leadership is the area targeted to diffuse the TQM instruction; however, the students are expected to apply the concepts throughout the four areas. The addition of six new lesson plans plus renovation of many existing lesson plans (which already fit well into the Air Force architecture) will be accomplished and tested with the next class. However, the total "in house" training time will remain the same, at approximately 220 to 230 hours for the curriculum. Several lesson plans incorporated or modified to teach students quality concepts include: goal setting, team building, focus on leadership, mission debriefing, and measurement tools. Most instruction is conducted during the first two weeks of class and then followed by application for the remainder of the curriculum. All students take the same curriculum so cross-discipline courses per se do not exist; however, the entire curriculum is geared to teaching across various disciplines.

Students do not actually participate in the development of the curriculum or individual lesson plans; however, students do participate in program development through an extensive goal setting period which is conducted at the beginning of the class year. Here students will individually, and collectively as a section, set academic and athletic goals for their particular section. A key aspect of the application of goal setting is the process review period conducted twice each week in which each section will brief their flight commander on their metrics and their progress toward their objectives. In order to have an effective process review, it is essential for the students to have good grasp of metrics.

There are no formal guidelines for regulating student workload, although a great deal of attention seems to be paid to ensure that student workload is reasonable. Current guidelines that exist seem to be primarily subjective.

COURSE DEVELOPMENT AND DELIVERY

The institution employs the following methods to help students comprehend and apply total quality principles:

Outside employers such as general officers and civilian business leaders are invited to talk to the students.

Team teaching is used to provide students with different perspectives.

Extensive use is also made of group discussion techniques, student team exercises, and real life scenarios.

Quality improvement tools including Pareto charting and flow charting are also integrated into various lesson plans.

FEEDBACK METHODS

Feedback from the students is obtained with a variety of methods including weekly critiques, end of course critiques, and "valentines" (forms that are available on which a student can make suggestions at any time). There is also an active student council, made up of one member from each squadron, that provides inputs to curriculum planners.

Specific areas in which student feedback is solicited include the specific instructor, the specific lesson, the entire curriculum, and the university educational environment.

Student feedback is seen by all senior leaders and curriculum developers, and is available to all the squadron and flight commanders.

Student feedback results in change to the curriculum and lessons through the following process. The feedback are compiled and statistically analyzed by the evaluation directorate and then distributed to the senior leaders (Director of Curriculum, Division Chiefs, etc.) A "Planning Board" then meets and confers on the results of the feedback. One such result is a compilation of "top ten comments" which is a collection of statistically significant comments and subjectively significant comments that are considered for action.

Generally, because of the shortness of the curriculum (7 weeks), the student does not have the opportunity to see the result or effects of the feedback in action.

The institution does have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study. The two primary methods are written testing (for knowledge level) and Flight Commander Observation of the application of quality skills.

Leadership areas are evaluated in several areas including rating by classmates, field team exercises, and a final war game called "Balboa"--an exercise where students are required to build teams, gather data, and execute war plans. Formal ratings (to include quality concepts) from Flight Commanders rate each student in "leadership" and "communication skills" at the 2, 4 and 7 week periods.

Feedback is solicited from the employers of the graduates using two basic methods. First, written surveys are sent out on an almost continuous basis asking supervisors and commanders to evaluate SOS graduates under their command. Second, field surveys are conducted, by regulation, every two years in which SOS representatives are sent TDY for ten days to several selected bases to interview field commanders face to face. Employer feedback results in change to the curriculum through basically the same methodology as the student feedback.

GENERAL ISSUES

According to Lt Col Varn, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles has been with the team building and quality leadership skills development.

Roadblocks encountered include the time required to implement changes, as well as the prevailing perception that, while the implementation of "quality education" has been directed by Air Force staff, it is not actively and properly supported from upper levels.

Further improvements that Lt Col Varn would like to make to enable students to comprehend and apply quality principles in their fields of study would be to convert the TQM awareness lessons (lecture and seminar formats) to a more comprehension and application oriented level.

Since many of the changes have only been recently implemented, many of the specific results have yet to be determined.

TELEPHONE SURVEY SUMMARY

NAME: William H. Hendrix

SCHOOL: Clemson University

POSITION: Head of Management Department

PHONE: (803)656-2011

DATE: 23 June 1993 TIME: 1430 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

A formal class specifically dealing with quality improvement concepts is offered. The course offered by the management department is not a mandatory course. There is an additional course which is mandatory for seniors in the area of Statistical Process Control. The TQM course does not focus on a particular advocate or approach. Deming is emphasized, but other thinkers in the field, especially Crosby, are introduced and contrasted to Deming.

The institution does have some general guidance for curriculum construction and content, but this guidance does not contain specific considerations for teaching students how to comprehend or apply total quality principles. Changes to the curriculum are made through a curriculum committee made up of regular teaching faculty in a department.

Changes made to the general curriculum structure to teach students how to apply total quality principles include a class on TQM offered as an elective, a required SPC course for senior undergraduates, revision of both the undergraduate and master's level curriculum to meet the requirements of the international arena--including the requirement of at least two semesters of a foreign language, reducing the number of business courses in the curriculum and introducing more liberal arts courses, creating a more quantitative Master's program in Industrial Management to set it apart from the less quantitative MBA, sending Master's students through the program in "Cohort Groups" where they are assigned many team projects together, and coordinating with professors to insert material in early courses which can be continued in successive courses by other professors.

Specific departments have adopted quality education initiatives more than others. There are 5 departments at Clemson which have adopted TQM initiatives. The Management Department is one of them. One administrative initiative is that the Head has given each faculty member a budget. Rather than come to the Department head with a money request, the faculty member has the authority to spend the money as he/she sees fit. She is then held accountable for her decisions.

Dr. Hendrix is not sure if the institution offers cross-discipline or multi-discipline courses, but the Management Department does use math and science courses to teach those fundamental skills to its students for use in the management curriculum. There is some discussion about a cross-discipline course in Engineering Management.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses.

Students participate in general curriculum or program development through the Student Advisory Group. Students in this group are volunteers hand-picked by the Department Head from the better academic students in the department, or from those in the TQM class.

There are general guidelines for regulating student workload. However, a practical approach is used by student advisors to help students pick the appropriate courses and workload.

COURSE DEVELOPMENT AND DELIVERY

Individual courses have not changed significantly to teach students how to comprehend or apply quality principles. Most of the effort has come from adding new courses while maintaining the flow and material of the old ones.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They invite outside employers (business leaders, CEOs) to talk to the students. This is done frequently. Taking advantage of the fact that many retirees live in the area, retired executives are often asked to share their experience in class.

Team teaching is not used.

Instructors from other disciplines or departments are occasionally asked to teach, usually on a fill-in basis, and normally not at a significant level.

Group discussion techniques are used heavily in many courses.

Lesson plans developed by prospective employers are not used.

Student team exercises are used sometimes.

Real life scenarios are often used in many courses.

Quality improvement methods including real life problem solving techniques, benchmarking, teamwork building techniques, and statistical process control are being gradually woven into various courses in the curriculum.

Other techniques they have found useful include the use of industry films about TQM, such as Deming's red bead exercise, the effort to eliminate waste and redundancy in course offerings, and pro-actively updating the curriculum by changing and adding requirements in order to meet proposed standards from the accrediting agency for business schools, to include a demand for continual improvement, adding liberal arts courses to the curriculum and addressing skills needed to conduct business internationally, such as foreign languages.

Specific courses have adopted quality education initiatives more than others, generally those in production and operation areas.

Students participate in course development only through the Student Advisory Committee.

FEEDBACK METHODS

Feedback from the students is obtained from the students using a student evaluation system consisting of a course critique modified to include some ranking questions; "How is the instructor compared to other instructors you've had?", "How is the course compared to others which you have had?", "How is the instructor's proficiency?" Mr. Hendrix says that most of the responses fall into a positive or negative category. If the student feels strongly one way or the other about the instructor or the course, almost all of the other responses coincide with the single dominant factor.

Specific areas in which student feedback is solicited include the specific instructor, the specific course, and the specific department. Questions about the curriculum and the university educational environment are asked, but only of graduating students at an outbriefing survey.

Student feedback is seen by the department head who keeps a summary sheet and the faculty who may use the

information as they see fit. Typically the feedback is used as documentation during tenure and promotion reviews.

Student feedback results in a change to the curriculum or a course only if a problem area is consistently written-up and the department head and the faculty member agree that a curriculum change can correct the problem.

One problem noted is that the students do not see themselves as part of the educational process. They do not consider it their responsibility to come prepared to class or otherwise become actively involved in the learning process.

The student does not have the opportunity to see the result or effects of the feedback unless it is an individual complaint made directly to the department head. In this case, feedback is given directly.

The students provide themselves with some feedback by gathering student evaluations/rankings of professors. This list is published by the student government.

Mr. Hendrix notes a concern with prioritizing the student feedback with feedback from other sources when it is received.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study, other than through regular testing of material presented as course material.

Feedback is solicited from the prospective employers of the graduates through annual surveys sent to graduates and their employers.

The employer feedback is seen by the Advisory Committee, the Department Head, and, in a summary, the faculty.

The employer feedback results in change to the curriculum or courses through the following process: the advisory committee looks at the employer demands and the needs identified by other customers and negotiates whether changes are needed, and where they should occur.

Changes in employer satisfaction with the university or with the students have been noticed, including a donation of software valued at $100,000, which is believed to be related to the performance of graduates employed at the company.

GENERAL ISSUES

According to Mr. Hendrix, the greatest success with Clemson's efforts to enable students to comprehend and apply

quality principles is the resulting quality of the graduates.

The greatest disappointment with their efforts to enable students to comprehend and apply quality principles is the difficulty in changing the basic attitude of students to accept responsibility of their own education, to adopt the attributes of integrity, honesty, and self-discipline.

Roadblocks encountered include the lack of funds to buy material, the entire budget process, and slow-moving bureaucracy in the curriculum revision process.

Processes that were found to be ineffective or impractical include paper and pencil team-building exercises, rather than real-life scenarios.

Further improvements that Dr. Hendrix would like to make to enable students to comprehend and apply quality principles in their fields of study include updating the teaching aids, obtaining a more globally oriented text for the classes, and bringing in additional expert speakers concerning the ISO 9000 standards and the criteria for the Malcolm Baldrige Award.

TELEPHONE SURVEY SUMMARY

NAME: John G. Surak

SCHOOL: Clemson University

POSITION: Professor, Food Science Department, School of Agriculture

PHONE: (803)656-2786

DATE: 17 June 1993 TIME: 0830 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

One formal class specifically dealing with quality improvement concepts is offered. Quality Control and Sensory Evaluation (along with the lab) is offered by the Food Science Department, and it is a mandatory course for the Food Science degree. It does not focus on a particular advocate or approach, but may slightly emphasize Deming's ideas.

The institution does not have any formal guidance for curriculum construction and content. Faculty members have control over curriculum within their jurisdiction. Review of curriculum and proposed changes is made by the Department curriculum committee. College and university level committees review the changes when courses may impact other departments. Acceptance of the proposed ideas by the other departments is sought during the review process. There is no guidance or step in the process which contains specific considerations for teaching students how to comprehend or apply total quality principles.

Changes made to the general curriculum structure to teach students how to apply total quality principles include the inclusion of the Quality Control Course as part of the Food Science program. Another course is proposed as an elective--"TQM for Food and Packaging." In other programs, new courses have been added over the last 3 years. The Engineering program has added 7 courses, Dr. Surak believed.

Specific departments or disciplines have adopted quality education initiatives more than others based on the concerns of the appropriate industry and the faculty's responsiveness to them. The Food Science, Management, and Engineering departments are good examples of departments which have adopted TQM initiatives.

The institution does not offer cross-discipline or multi-discipline courses, but the proposed "TQM for Food and Packaging" will be cross-listed with the Industrial Education Department.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses, but does conduct a short course for Faculty to promote teaching across the span of the curriculum.

Students do not participate in general curriculum, program, or course development.

There are no specific guidelines for regulating student workload. Student advisors throughout the university counsel students to take the best courses and loads, but it is all done on an individual basis.

COURSE DEVELOPMENT AND DELIVERY

Changes have been made to a particular course - Quality Control and Sensory Evaluation - to teach students how to comprehend or apply quality principles. Starting approximately seven years ago, the course began to be modified to reflect TQM principles. Some short courses started featuring frequent (2/day) opportunities for student feedback about the course's pace and difficulty.

The department employs the following methods to help students to comprehend and apply total quality principles: They invite outside employers (business leaders, CEOs) to talk to the students (although Dr. Surak had not done that personally).

Team teaching is used. Instructors from other disciplines or departments are invited to teach (Dr. Surak has been invited to teach, although, again, he has not invited others, himself). Group discussion techniques are employed.

Lesson plans developed by prospective employers have not been used, but often developed syllabi have been circulated to employers for their feedback. Employers in the local area which have cooperated include Campbell Foods and Sunoco. Professor Surak identified the faculty as holding the curriculum and having a need to receive some input to make sure the appropriate issues are being covered.

Student team exercises and real life scenarios are used, as well as quality improvement methods within various courses, including real life problem solving techniques,

teamwork building techniques, and statistical process control.

Other techniques they have found useful are demonstrations, including prepared ones like Deming's red bead exercise.

Specific courses in architecture, textiles, and civil engineering have adopted quality education initiatives more than others, in order to be responsive to the trends in their industry.

FEEDBACK METHODS

Feedback from the students is obtained from the students end-of-course surveys, non-verbal evaluation of students' comprehension by the faculty member, by class discussion, and, in some short courses, by frequently seeking input about the pace of the course and the comprehension of what has been presented so far. The feedback allows the professor to provide immediate clarification, as needed, of course material. Also, senior exit interviews are given by the department head to all graduating seniors from the Food Science Department.

Specific areas in which student feedback is solicited include the specific instructor and the specific course. Questions about the specific department and the entire curriculum are asked during the senior exit interview given to all graduates of the Food Science Department (one, last year; but the average is around 8 per year) by the department head.

Student feedback is seen by the instructor for the end of course critiques. The instructor can keep them for his files to be used for promotion or tenure review, otherwise they can be discarded. The department head alone sees the exit interviews, except on a case by case basis with negative comments.

The reputation of the department (with the small size) is to know the students very well.

Student feedback does not result in change to the curriculum or courses unless an individual instructor feels compelled to modify a course based on a student's critique.

The student does not have the opportunity to see the result or effects of the feedback in action.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study but Dr.

Surak believes in a socratic approach to determine the level of the student's understanding.

Feedback is solicited from the prospective employers of the graduates by circulated syllabi to employers for their input and by soliciting ideas for case studies from corporations. That way the real life problems worked on by the students are of interest to business's interests. There is also an Industrial Advisory Board with representatives from small to medium size local companies, but the board operates more in theory than in practice.

The employer feedback is seen by the instructor.

The employer feedback results in change to the curriculum or courses depending on the individual responsible instructor who has the freedom to decide.

Changes in employer satisfaction with the university or with the students have not been noticed.

GENERAL ISSUES

According to Dr. Surak, the greatest success with his efforts to enable students to comprehend and apply quality principles is his experiment with removing the grading process from the students (giving them all A's). By moving issues into discussion from lecture, the students were forced to keep up, do the reading, apply, and think.

His greatest disappointment with his efforts to enable students to comprehend and apply quality principles was that the students didn't like his plan. They thought it was too much work.

Roadblocks encountered include the student's perception of their workload and the process of curriculum approval slows down the rate of change possible.

Processes that were found to be ineffective or impractical were trying to determine what rigors could be relaxed without sacrificing results.

Further improvements that Dr. Surak would like to make to enable students to comprehend and apply quality principles in their fields of study include a short survey for undergraduate students like the one in the short courses and he wants to incorporate the method of providing two sides to each issue, letting the students debate and evaluate the merits of each side.

TELEPHONE SURVEY SUMMARY

NAME: Dr. Marek P. Hessel

SCHOOL: Fordham University

POSITION: Associate Professor of Management

PHONE: (212) 636-6214

DATE: 14 May 1993 TIME: 1100 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with Quality Improvement concepts such as TQM, Continuous Improvement, etc., are offered. They are mandatory/core for management related fields. Several courses are offered covering a variety of Quality improvement philosophies. However, within the Deming Scholars Program, quality improvement courses generally focus on the Deming philosophy.

While there is guidance on curriculum construction and content, it does not contain specific considerations for teaching students how to comprehend or apply total quality principles.

The most notable changes made to the general curriculum structure to teach students how to apply total quality principles are within the Deming Scholars Program which employs a course structure consisting of 8 weeks of academic instruction followed by 7 weeks of internship with a business.

Specific departments or disciplines that have adopted quality education initiatives more than others are the management area itself, which seems to be more focused than other areas. However, since this program is relatively new (one year old program) the full results have yet to be seen.

The institution does offer a variety of multi-discipline courses cross listed among various departments. However, the institution does not have specific formal guidelines to teach across disciplines or offer multi-disciplinary courses.

Guidelines for regulating student workload are: part time students are limited to 2 courses per term, whereas the full time students are limited to 5 courses per term.

COURSE DEVELOPMENT AND DELIVERY

The following techniques are employed to teach students total quality principles. Outside employers (business leaders, CEOs) are invited to talk to the students.

Team teaching is done with instructors from the same department and from other disciplines or departments.

Group discussion techniques and real life scenarios are used.

Quality improvement methods such as real life problem solving techniques, benchmarking, teamwork building techniques, and statistical process control, are integrated and taught within various courses.

Generally, students do not participate in individual course development.

FEEDBACK METHODS

Feedback from the students is obtained using formal end of course of critiques, consisting of a quantitative rating section and a written commentary section. Some instructors (on an individual basis) obtain commentary evaluations more frequently.

Specific areas in which student feedback is solicited include the specific instructor and the specific course. A Student Advisory Council processes and summarizes the formal end of course critiques. The instructor sees the entire student feedback form. The quantitative results are available to the administration and the students.

Student feedback results in change to the curriculum and courses primarily through subjective evaluation (there is no formalized methodology for determining and executing changes).

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study.

Feedback is not formally solicited from the prospective employers of the graduates. Currently there are no noticeable definitive changes in employer satisfaction with the university or with the students.

GENERAL ISSUES

According to Dr. Hessel, the greatest success with efforts to enable students to comprehend and apply total

quality principles is sensitizing the students to the fact that there has been a radical change to the way of management in a company.

The greatest disappointment with efforts to enable students to comprehend and apply total quality principles has been a lack of useful teaching materials (text books, etc.).

Roadblocks encountered include the fact that many students have either little fundamental knowledge of total quality concepts or they have preconceived prejudices against total quality management principles.

Processes that were found to be ineffective or impractical include team teaching (with instructors from the same department) which was not as effective as originally anticipated. It sometimes presented some discontinuities.

Further improvements Dr. Hessel would like to make to enable students to comprehend and apply total quality principles in their fields of study would be to integrate quality improvement instruction throughout non-quality specific courses.

TELEPHONE SURVEY SUMMARY

NAME: Dr. Joyce N. Orsini

SCHOOL: Fordham University

POSITION: Dean of Deming Scholars Program

PHONE: (212) 636-6219

DATE: 17 May 1993 TIME: 1400 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement concepts are offered. The course offered by the Management department is a mandatory/core course for all MBA students. It focuses primarily on Dr. Deming's approach but also provides general background into other approaches.

The institution does have formal guidance for curriculum construction and content. This guidance contains general considerations for teaching students to comprehend and apply total quality principles but does not go into specifics.

Changes made to the general curriculum structure to teach students how to apply total quality principles include an initial training of the faculty in Dr. Deming's principles followed by the incorporation of the principles into the MBA curriculum. A more recent development has be the "Deming Scholars Program"--a fully accredited eighteen month MBA program taught in the context of Deming's principles. It is structured around five "cycles of learning." The first cycle is fifteen weeks, the first eight weeks of which are in the classroom. The class meets for approximately twenty hours a week and receives reading, homework, study and research assignments. The format is an integration of topics in which each topic is delivered "just-in-time" for the students to see how the subject matter fits together in the overall educational context. The classroom training is then followed by a seven week internship at a company where the students build upon the concepts learned in the first eight weeks. This cycle is then repeated in Cycles 2 through 4. The fifth cycle contains only the classroom instruction format. The entire MBA program carries the equivalent of 70 credit hours. Dr. Deming is a senior advisor to the program.

Teaching across disciplines is generally the rule. The proposal for new courses in the program are first reviewed by a Curriculum Committee which is represented by all the disciplines involved in the program. Approval for the new course is then made with the concurrence of these representatives.

Students in the "Deming Scholars Program" do participate in general curriculum or program development. Each class is composed of approximately eight to fifteen students who stay together throughout the entire program. The students that go though the program are typically those who are returning for specific education in quality principles to help their companies make the transformation to TQM. Efforts are therefore made to tailor the program to meet the specific needs of the students. Beginning with the first day of class and periodically throughout the program, student inputs are solicited in a discussion format. The curriculum is then modified as necessary to meet the students' needs. Changes are determined primarily through consensus of the students and teachers.

COURSE DEVELOPMENT AND DELIVERY

All courses in the Deming Scholars Program were overhauled to teach students how to comprehend or apply quality principles. This involved the inclusion of general theory and quality tools followed by their application through the internship program.

The institution employs the following course delivery methods to help students to comprehend and apply total quality principles:

Outside employers such as business leaders and CEOs are invited to talk to the students.

Team teaching is conducted with instructors from the same department and from other departments.

Group discussion techniques and student team exercises are used extensively.

Real life scenarios are conducted in the form of the seven week internships in which each student works full time for a particular company under the supervision of one of the companies' executives.

Quality improvement methods such as real life problem solving techniques, benchmarking, and statistical process control are integrated and taught within various courses.

Input for lesson content is solicited from prospective employers; however, the actual lesson plans developed by these employers are not used because it is believed that these employers may not be fully aware of what material is best for the students.

Another technique found useful to help students comprehend and apply total quality principles are reinforcement exercises. One such example is an exercise where students are taken to the rifle range to shoot bullets. They are then given the opportunity to try different methods to improve their shooting performance and to experience what happens when they try these different approaches. This particular exercise can be helpful in demonstrating how one can actually make a process worse--what Dr. Deming refers to as "tampering."

FEEDBACK METHODS

Feedback from the students in the Deming Scholars Program is obtained throughout each cycle through on going interaction between faculty and students. (This type of feedback is made possible by the relatively few number of students involved in each class.) Additionally, a formal review is conducted each cycle covering what was learned and how it was learned and includes a student self assessment. From this the faculty determines what the students have learned and what they would like to learn. This in turn is used to help design material to be taught in the next cycle. These reviews serve the dual purpose of obtaining feedback on the effectiveness of the course presentation as well as obtaining a measure of how well the students are comprehending and applying quality principles.

The university itself also has a formal written critique that is conducted at the end of each course. Student representatives are also invited to speak at university faculty meetings. Specific areas in which student feedback is solicited include the specific instructor, the specific course, and the specific department.

In the Deming Scholars Program feedback is made available to the Curriculum Advisory Board for the program and any interested faculty member or student.

The university does attempt to obtain feedback from the prospective employers of the graduates but Dr. Orsini was unfamiliar with the details of the process. The Deming Scholars Program itself does solicit feedback but it is done informally though word of mouth interaction.

GENERAL ISSUES

According to Dr. Orsini, the greatest success with the institution's efforts to enable students to comprehend and

apply quality principles has been the Deming Scholars Program as a whole.

The greatest disappointment according to Dr. Orsini with their efforts to enable students to comprehend and apply quality principles has been that students are not adequately equipped in quality principles prior to arrival at the Deming Scholars Program--a lot of rework is therefore required.

As of yet, no notable roadblocks have been encountered.

Further improvements that Dr. Orsini would like to make to enable students to comprehend and apply quality principles include lengthening the time available to teach students by increasing the number of course hours.

TELEPHONE SURVEY SUMMARY

NAME: Dr. Stanley G. Aman

SCHOOL: Jacksonville State University

POSITION: Head Department of the Department of Technology

PHONE: (205) 782-5295

DATE: 19 May 93 TIME: 1500 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

A formal class specifically dealing with quality improvement concepts is offered and is a core requirement for technology majors. It does not focus on a particular advocate or approach, rather it examines several approaches.

The institution does not have any formal guidance for curriculum construction and content; however, several quality oriented courses added to the curriculum include Continuous Quality Improvement, Reliability Technology, Quality Assurance, Quality Audit, and Quality Cost courses.

Specific departments or disciplines that have adopted quality education initiatives more than others have been the department of Technology and the School of Business. Specific results are too early to tell; however, the increased emphasis on quality control technology has been well received by the community.

The School of Technology does not offer any specifically designated cross-discipline or multi-discipline courses, and does not have guidelines to teach across disciplines or offer multi-disciplinary courses.

Students do not generally participate in general curriculum or program development (except through end of course/semester critiques).

Guidelines for regulating student workload are: normal load 16 semester hours (waivable by the department head); full time status load is 12 semester hours and the maximum load is 21 semester hours (not waivable).

COURSE DEVELOPMENT AND DELIVERY

The institution employs the following methods to help students to comprehend and apply total quality principles:

They frequently invite outside employers (business leaders, CEOs) to talk to the students.

They employ group discussion techniques.

They use student team exercises. One such exercise is the continuous quality improvement exercise in which the team solves either a fictitious or actual problem (as identified by the student who may have encountered the actual problem in his or her career field). They use real life scenarios including case studies and actual problems faced by the students in their career fields.

FEEDBACK METHODS

Formal feedback from the students is obtained using several methods. Entry interviews are conducted to assess the expectations of the students and the effectiveness of the programs and instructors at the institution. Exit interviews are conducted for each student leaving the institution (for any reason). Course and instructor evaluations are conducted at the end of each course. And a post graduate survey is conducted six to nine months after graduation to asses the effectiveness of the education to the students.

Specific areas in which student feedback is solicited include the specific instructor, the specific course, the specific department, the entire curriculum, and the university educational environment as a whole.

Another key element of the curriculum and the feedback program is the student-advisor interaction. The advisor is responsible for a particular subject area and interacts with his students at least once a semester. The institution and the students rely heavily on that interaction.

Student feedback is seen by department heads and instructors.

Student feedback results in change to the curriculum and courses through the following process. The faculty member is required to formally respond to areas of concern. An area of concern is usually determined by notable or numerous suggestions or responses from the students that rate the instructor low on a particular area--such as relevancy of material or timeliness of evaluations. This information goes into their personal file as part of the assessment of the instructor--the emphasis here is not to

"beat up" on the instructor but for use as an improvement tool. Additionally, each faculty member serves as a member of the curriculum committee.

Feedback is solicited from the prospective employers of the graduates through a variety of ways. An annual employer survey is conducted starting one year after student graduation. Advisory committees meet periodically each semester. Industrial visits are conducted two to three times a semester. The university is also a host site for a total quality network training program conducted in conjunction with the Chamber of Commerce for business managers--the program is a three day management overview of total quality management concepts and tools. This is then followed by the managers going back into their firms and designating teams of 5-7 people who return to campus one day a week every other week for 13 weeks for classroom instruction. They in turn will identify a problem related to a quality issue in their company. This has been very successful in the community and successful for providing feedback to the institute.

The employer feedback is seen by faculty and administration. Change to the curriculum or courses is accomplished through initiatives by the individual faculty who are charged to make changes to their courses.

Changes in employer satisfaction with the university or with the students has been positive. The Chamber of Commerce now asks representatives from the Department of Technology to speak with prospective companies that are considering locating in the area. Likewise Department of Technology representatives are continuously asked to speak to different industrial and professional groups. Post grad employment has improved. Within two years, unsolicited phone calls from companies seeking graduates have gone from near zero to more than the number of students that are graduating--in short the Department of Technology is turning employers away. A dramatic increase in enrollment has also occurred (143 to 207 in the Technology Department).

GENERAL ISSUES

According to Dr. Aman, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles has been reflected in the dramatic increase in Technology Department's enrollment and employer requests for graduates. Also the president of the university is very supportive of the campus business affairs and the academic arena toward total quality management initiatives.

Further improvements that Dr. Aman would like to make to enable students to comprehend and apply quality principles in their fields of study would be to make the continuous quality improvement course a core requirement for every student on campus.

TELEPHONE SURVEY SUMMARY

NAME: Dr. Tom Johnson

SCHOOL: North Carolina State University

POSITION: Professor of Management

PHONE: (919) 515-2258

DATE: 7 May 93 TIME: 1100 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with Quality Improvement concepts are offered. The course offered to the Industrial Engineering undergraduate students is mandatory. Courses offered for other majors are generally not mandatory. The courses do not typically focus on a particular advocate or approach. The Master's of Management program however does emphasize a TQM approach. All quality improvement courses offered by the different disciplines focus on general aspects of various quality improvement approaches.

The school does have formal guidance for curriculum construction and content but does not contain specific considerations for teaching students how to comprehend and apply total quality principles.

One method to implement change to the general curriculum structure (to teach students how to comprehend and apply total quality principles) is a two day workshop with university personnel (from on and off campus) and outside industry that concentrates on what elements of TQM should be in the curriculum. This is done for the engineering and management students. Work is in progress to revise this process as well as the curriculum.

Specific departments or disciplines which have more adopted total quality education initiatives more than others include the Management, Industrial Engineering, and Statistics departments. Specific results are too early to discern but the general informal reaction is positive.

The institution does offer a variety of multi-disciplinary courses that are listed by two or more

departments including the Operations Research, Statistics, and Industrial Engineering departments.

The institution does not have specific guidelines to teach across disciplines or offer multi-disciplinary courses. Administrative policy attempts to encourage the development of multi-discipline courses by crediting the home department of the instructor that is teaching the student.

Students do not noticeably participate in general curriculum or program development.

Guidelines for regulating student workload are the following semester hours: For undergraduates, normally 18 hours maximum unless specific permission is obtained from the major department head; 21 hours maximum unless specific permission is obtained from the dean. For graduate level, normally 12 semester hours; most take 9 semester hours when conducting classes in conjunction with research assistantships.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular course or courses to teach students how to apply quality principles include the institution course "Managing for Quality."

The university employs several methods to teach students to comprehend and apply total quality principles:

Outside employers such as business leaders and CEOs are invited to talk to the students. The College of Management does this through a series of total quality forums 4 times a semester (for the last two years). And a workshop is also conducted with integrated manufacturing systems where monthly meetings are held with business leaders.

The Industrial Engineering senior project design which is done in teams--the course instructor arranges for each of those teams to be supported by another faculty member.

Instructors from other disciplines or departments are invited to teach. Here a tele-conferencing network is often used to allow instructors from other universities to teach.

Group discussion techniques are employed extensively.

Lesson plans developed by prospective employers are incorporated into course lesson plans--here prospective employers were used to benchmark the objectives and course content for one experimental course. And an outside consultant was used to provide a weeks worth of instruction for the time management portion of the course.

Student team "term projects" are used extensively in various disciplines. These projects generally involve process improvement for the campus, local industry, and

local hospitals. The projects involve generating real data and improvement to real processes. The emphasis is to work in teams on real problems with real data.

Quality improvement methods such as real life problem solving techniques, benchmarking, teamwork building techniques, and statistical process control, are integrated and taught within various courses, particularly in the College of Management.

Specific courses have adopted quality education initiatives more than others. Both the students and employers of the graduates who have received quality courses (namely from the "Managing for Quality" course and the Industrial Engineering team projects) relate that these methods are much better than the traditional case study method.

FEEDBACK METHODS

Daily formal feedback in several Statistics and Management courses were attempted but the instructor did not find it useful. However, an experimental course that solicits daily "fast feedback" from the students may hold more promise. The key difference here is the employment of an assistant to do a content analysis on open-ended questions. The fast feedback is seen only by the individual instructor. However students can generally see the results of their feedback in action.

End of course, formal critiques are also used. The results are seen by the particular instructor and department heads but are not published for the other instructors or students to see. Specific areas in which student feedback is solicited include the specific instructor, the specific course, the specific department, the entire curriculum.

There is no specific formal process to institute change to the curriculum or courses from the student feedback. Changes are initiated based upon a subjective evaluation of the feedback.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study.

Feedback has recently been solicited from the prospective employers of the graduates--the process is currently under development. While there is no formal mechanism for obtaining feedback from prospective employers, the "Managing for Quality" course was developed as a direct result of a senior bank executive (a recruiter and major

employer of business management students from this university) commenting on why there was nothing on quality in the curriculum. Informal feedback from employers on those students who have had this course, as well as those who have had the engineering TQM technical option, seems very favorable.

GENERAL ISSUES

The greatest success with efforts to enable students to comprehend and apply total quality principles has been the real projects done by students in teams. As a result, the Chancellor has taken up the lead to further TQM education initiatives for the entire Campus.

The greatest disappointment with efforts to enable students to comprehend and apply total quality principles has been that, until recently, a lack of strong permanent leadership resulted in slowness to permeate the rest of the curriculum with these initiatives. Also getting students out with employers in teams has been difficult, with limited funding, to replace old style internship programs.

TELEPHONE SURVEY SUMMARY

NAME: Lt Col Dave Porter

SCHOOL: United States Air Force Academy

POSITION: Professor, Department of Behavioral Sciences

PHONE: (719) 473-8325 DSN: 259-8325

DATE: 21 May 1993 TIME: 10:00 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement concepts are offered. The USAFA (United States Air Force Academy) has incorporated the philosophy into four required courses for all cadets (undergraduate students and officer candidates). All freshman cadets are exposed to the principles of TQM and the Air Force's commitment to the concept in professional development seminars taught by volunteer faculty and staff. In each subsequent year, one of the core courses has been specifically modified to teach some aspect of TQM. A course in statistics is now one half statistical process control, a sophomore management course has six lessons of instruction on TQM, a junior behavioral science course has been given a TQM perspective, and an elective behavioral science course - "Organizational Behavior" - is available with about one third TQM material. It does not focus on a particular advocate or approach, but probably favors Deming.

The entire USAFA faculty has undergone TQM training as part of the Air Force adoption of TQM. Personnel responsible for training other staff underwent more extensive training, including pulling faculty out of their teaching responsibilities for the training. One out of fifty were identified as trainers. The remaining people took part in 2-day workshops and classes were suspended during the total of 16 hours of in-service training, which wrapped up with an evaluation of the outcomes and self-assessment.

The institution does not have any formal guidance for curriculum construction and content. The faculty have control over developing the curriculum in a traditional framework. The Department of Behavioral Sciences has been focusing on the continuous improvement of its existing

courses rather than on adding new courses to the curriculum. The changes in courses (statistics, management, and organizational behavior) were decided on as an institutional response to the mission of teaching cadets about TQM. Each department has since been free to determine what else - if anything - needs to be done in their area. And there is a great deal of variation in the response among departments. Lt Col Porter speaks for the case in Behavioral Sciences, and, even more specifically, of his own observations.

Over the last 3-4 years, Lt Col Porter has been involving the faculty in the Behavioral Department in improving the educational process in the department by assessing the outcome of the curriculum, determining the desired outcome, evaluating the contribution of each course to that outcome, and making changes as needed.

Changes made to the general curriculum structure to teach students how to apply total quality principles have not been an important part of the department's move to TQM. Again, they have concentrated on improving the existing curriculum and, at first, "subversively" introducing a total quality, continuous improvement way of thinking. Collaborative efforts at improvement on the part of the involved faculty introduced innovations that were successful and gradually persuaded other faculty members to accompany the effort until a critical mass was reached in the department and larger scale changes could be introduced.

Specific departments or disciplines have adopted quality education initiatives more than others. The academic departments at the USAF Academy are not forced to accept TQM into their curriculum. Therefore, there is a variety in the amount of adoption of TQM within different departments. The results for the Department of Behavioral Science have been very positive. Enrollment in the department's courses over the last two years has increased by 24% and the ratings for the courses and instructors in the department on end-of-course critiques have gone up significantly.

The department does offer cross-discipline or multi-discipline courses, including some unlikely combinations, like physics and psychology; which explores problem-solving, methods of learning, and energy transfer (external to internal).

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses. Faculty volunteer for these new courses. The administration in the department tries to create opportunities for them to do so and also create an atmosphere of trust and understanding to encourage the faculty to take risks.

Students do not participate in general curriculum or program development except for special-topic courses where student majors are asked for their interests.

One problem that the USAFA faces is a reduction in students corresponding to the downsizing of the officer corps. The manpower allocations for faculty are based on student numbers, and so are also cut. The problem is that, while the teacher-student ratio is maintained, the ability to teach diverse courses is reduced. Course proliferation is a major concern and there are very real limits to the number of different courses that can be offered.

Guidelines for regulating student workload are relatively detailed. Like the other service academies, the USAFA tries to maximize what it asks of the cadets' time. Therefore, time studies are done regularly in order to keep activities--including academics--in balance.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles include emphasizing the general principles of continuous improvement and the principles of learning. Lt Col Porter considers it to be centrally important to get students to be active in class and, in the course. In order to be successful at this, the students must be confident that they will be allowed to make mistakes and learn from them without jeopardizing their academic standing. Additionally, teamwork requirements are emphasized in most of the courses.

The department employs the following methods to help students to comprehend and apply total quality principles:

They invite outside employers (business leaders, but, more often, Air Force commanding officers) to talk to the students.

Team teaching is not planned and rarely occurs.

The department has eight adjunct professors outside Behavioral Sciences who serve as instructors for some courses.

Group discussion techniques are used.

Lesson plans developed by prospective employers are not used.

Student team exercises are regularly used.

Real life scenarios are also used.

Quality improvement methods within various courses , such as real life problem solving techniques, benchmarking, teamwork building techniques, and statistical process control are used in favor of creating new courses.

Other techniques they have found useful include asking students after each and every lesson two questions, "What's the most important point?" and "What's the murkiest point?". The results of these two questions form the basis of a review at the start of the next lesson.

Specific courses have adopted quality education initiatives more than others. Course directors and volunteer faculty members from four courses, initially, formed teams to review the role that the courses fit in the curriculum. Three of the four courses were able to adopt quality initiatives immediately and the fourth tried again later and found success the second time. The results were that the student ratings of the courses and faculty went up and the observed student performance in the classes also went up.

Students do not participate in course development formally. They do write a proposal, however, in order to apply for an independent project course.

FEEDBACK METHODS

Feedback from the students is obtained daily in the form of the two questions which are asked, weekly with a more involved survey, and at the end of every course with a critique. The weekly feedback is reviewed with the students about every two to three weeks. A review of uncovered or misunderstood material is held. A discussion of the course, the student comments, and what the instructor has done, or will do about them is another important part of the exercise. The assessment is seen as a conversation between students and faculty, where the students see the role their comments play in the process and the faculty shares their own decision process with the students. The students, in turn, assume more ownership of the process and thus make better suggestions.

Specific areas in which student feedback is solicited include the specific course, department, the entire curriculum, and the educational climate.

Feedback is also regularly asked of the faculty about their attitudes toward quality, their satisfaction, the organizational environment, and their perception of equity in the department.

Questions about the cadet's perception of the university educational environment are indirectly asked of them through squadron questionnaires dealing with climate and leadership issues.

Student feedback is seen by the course director. It is not "posted" for everybody to see. It is merely shared with the faculty teaching the course.

Student feedback result in change to the curriculum or courses through integrating it into the iterative process of assessing the success of the course in reaching its objective in the curriculum.

The student sees the result or effects of the feedback in action when it is given during the course and the professor discusses it. When it is given at the end of the course; however, there is not a process for the cadets to see the results of their last inputs.

The Behavioral Sciences Department measures how well the students are comprehending and applying quality principles within their fields of study by assessing how well the students are able to work together during group tests and projects. Other measures are traditional testing of concepts or tools presented in class.

One other initiative is a practice of having students take tests of course material individually, and then have them come back during the next lesson and retake the test in groups. The purpose is to review and strengthen their comprehension, as well as to gain a sense of success and mastery, as the groups are usually able to solve problems with which the individuals had trouble.

Feedback is solicited from the prospective employers of the graduates. About ten percent of the Behavioral Science graduates are assigned to the Occupational Measurement Squadron at Randolph AFB. Others go to labs at Brooks AFB and at Wright-Patterson AFB. Frequent, informal communication is maintained, especially with the Occupational Measurement Squadron. Sometimes, they request research and occasionally visit the USAFA, where they have also given presentations and talked with the cadets about job responsibilities in the career field.

The employer feedback is seen by the faculty and students when it comes in the form of a presentation to the department. The department head and faculty see the feedback when they request it. Again, it is primarily informal in nature.

The employer feedback results in change to the curriculum or courses informally when the faculty decides that the curriculum is neglecting an area of concern. Either the curriculum is modified to embrace the concern, a

course is changed or modified to discuss the "hot" topic, or a presentation is prepared for the majors students. Examples, recently, of topics have been "Combat Stress" and "Human-Computer Interface."

Changes in employer satisfaction with the department have been noticed, but there has not been a discrete change. The Behavioral Science students have been very well received. Some of the better students have been accepted into positions which required a Master's level degree and have performed impressively. Lt Col Porter considers this a strong endorsement of the department's program.

GENERAL ISSUES

According to Lt Col Porter, the greatest success with the department's efforts to enable students to comprehend and apply quality principles is the establishment of a climate of continuous improvement. The faculty and students take great pride in their work, and students have been attracted to the major despite increasing requirements for acceptance.

The greatest disappointment for Lt Col Porter with his efforts to enable students to comprehend and apply quality principles has been getting the word outside the department. There are too many aspects outside the Behavioral Science Department that are counter-productive to Quality initiatives.

The principal roadblock encountered by Lt Col Porter has been the struggle to develop a level of trust between the faculty and the cadets.

Processes that were found to be ineffective or impractical include outside Quality gurus (such as Crosby who advise that "quality is free"), and those who would come to assist the faculty in adopting TQM. The external nature of a consultant's advice made it very unpalatable to the faculty. After the initial training of a cadre of trainers, Lt Col Porter strongly recommends that the incorporation of Quality initiatives be advanced internally. Ownership of the process and the comfort of ideas coming from trusted sources are great facilitators in the process of change.

Lt Col Porter was unaware of any further improvements that he might like to make to enable students to comprehend and apply quality principles in their fields of study, but he was sure that the students, the junior faculty, or some visiting civilian instructor would think of something.

TELEPHONE SURVEY SUMMARY

NAME: Lt Col John Stubblefield

SCHOOL: United States Air Force Academy

POSITION: Director of Quality Assistance

PHONE: (719) 473-4332 DSN: 259-4332

DATE: 21 May 1993 TIME: 14:00 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Lt Col Stubblefield is not directly responsible for the majority of cadet instruction. His present role is to organize and conduct the training of the faculty and staff at the USAFA. His answers reflect his experience with the classes being conducted by his office for the different organizations at the USAFA.

Formal classes specifically dealing with quality improvement concepts are the primary means of educating Academy personnel about the Air Force's variant of TQM, called Quality Air Force (QAF). Nearly 100% of Academy staff have undergone at least the basic training in QAF. The Superintendent and two letter officers attended a 2-day workshop. Supervisors attended a 4-day workshop Others went to a 1-day course, all of which was mandatory. The course offered does not focus on a particular advocate or approach by any quality guru but rather has adapted material from the Air Force Quality Center. They did this by building courses around the AFQC learning objectives.

The institution did use the AFQC learning objectives as formal guidance for curriculum construction and content. This guidance is specifically designed to teach students how to comprehend or apply total quality principles. Because it is modified for specific use at the Academy, it is constantly being modified, always with the intention of improving the quality of the education.

Specific organizations on base have adopted quality education initiatives much more than others. Some have been very reluctant to do even the required minimum training, while others have gone well beyond the training offered, including benchmarking themselves with leading civilian examples (such as the hospital with the Hospital Corporation

of America and transportation and the civil engineers with the industrial area). They have progressed well beyond the original scope of the provided training.

The training courses can't really be defined as cross-discipline or multi-discipline courses, but try to teach TQM in a holistic manner and not merely as a collection of philosophical points and analytical tools.

The institution does not have guidelines to teach across disciplines, offer multi-disciplinary courses, or teach in any specific manner. The courses are free to evolve as better ideas are suggested, tried, and evaluated.

Students do participate in general curriculum or program development through feedback sheets, feedback sessions, commander critiques (based on information brought back to the organization or observed after the trained employee returns). The changes to the courses is so extensive that they bear no resemblance to the original courses. An additional course in metrics and other statistical/control tools is being developed to be added to the curriculum, based on student feedback. The AFQC's objectives are kept untouched, all else is fair game.

Guidelines for regulating student workload are informal. Because the students are employees missing from organizations performing normal duties, some supervisors are reluctant to allow their people time off to attend classes. Lt Col Stubblefield thinks that 90% of his problem is convincing supervisors to invest in their people.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles include what was mentioned above.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They do not invite outside employers (business leaders, CEOs) to talk to the students. Staff training is done by on-station personnel.

Team teaching is the primary method used in the courses.

The instructors for the courses are from all over the Academy. In one regard, all the instructors are from other departments, united for the quality discipline.

Group discussion techniques are employed throughout the courses.

Lesson plans developed by prospective employers are used extensively. The lessons have "stolen liberally from every command's course." Additionally, training tools developed by corporations engaged in TQM have also been used to develop course material.

Course guidance is to use student team exercises.

Real life scenarios are built and new ones are continually being requested from students.

The integration and teaching of quality improvement methods within the courses is especially emphasized for the supervisor program.

Other techniques they have found useful include using the instructor more as a facilitator than as a lecturer, showing professional business TQ videos and movies (Joel Barker's Business of Paradigms and Hidden Assets, Empowering Government Workers were recommended).

FEEDBACK METHODS

Specific areas in which student feedback is solicited include the specific instructor, the specific course, and the entire curriculum.

Student feedback is seen by the instructor. The director (Stubblefield) only sees that which instructors decide to elevate to him. The delegation on improving the courses is complete in that sense. Lt Col Stubblefield is interested in things that he can control, mostly getting people from organizations to attend the training.

Student feedback result in immediate change of the curriculum and the course, if possible. The instructor decides if it is a constructive change and has the authority to immediately implement it.

Ordinarily, the student does not have the opportunity to see the result or effects of the feedback in action because the course is so short. It is possible for the instructor to telephone a student in order to clarify a criticism.

The institution does not have specific end-of-course methods to measure how well the students are comprehending and applying quality principles. So much student

participation is asked for in the course that the instructor can usually evaluate the level of understanding, at least indirectly.

Feedback is not solicited from the employers of the graduates, but a certain amount of both good and bad feedback is received informally from the commanders and supervisors.

The employer feedback is seen by the director.

The employer feedback has had a minor effect on curriculum or courses.

Changes in employer satisfaction with the course or with the students has been noticed, but it has been inconsistent.

GENERAL ISSUES

According to Lt Col Stubblefield, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles has been changing the "I dare you to teach me something" attitude of some of the students.

The greatest disappointment with their efforts to enable students to comprehend and apply quality principles has been the difficulty in convincing everyone of the need for the training.

Roadblocks encountered include the same as above disappointments.

Processes that were found to be ineffective or impractical include bringing in outside help (consultants). They stimulated an immediate distrust and emotion characterized by the attitude of "This guy doesn't know what I'm doing so he can't help."

Further improvements that Lt Col Stubblefield would like to make to enable students to comprehend and apply quality principles in their fields of study include adding more courses for the most motivated, especially in planning, benchmarking, and metrics (facing constraints in time and manpower).

TELEPHONE SURVEY SUMMARY

NAME: Commander Mike C. Beck

SCHOOL: United States Naval Academy

POSITION: TQM Advisor to the Superintendent

PHONE: (410) 267-2877 DSN: 281-2877

DATE: 17 May 1993 TIME: 1500 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

Mandatory formal classes specifically dealing with quality improvement concepts are offered to all students. The courses focus primarily on Dr. Deming's approach to TQM. The institution does have formal guidance for curriculum construction and content within the Naval Leadership curriculum.

Guidance containing specific considerations for teaching students how to comprehend or apply total quality principles is currently under development. It is intended to focus on the process of teaching the instructors to present course material in a way which will have the fullest impact--this Quality Education approach will be modeled after an approach used by David Langford (a model based on Deming's theories which Langford practiced at Mt. Edgecombe High School in Sitka, Alaska). It will be tested on a small scale this fall.)

Changes made to the general curriculum structure to teach students how to comprehend and apply total quality principles include an overall change to the entire four year core curriculum for leadership. The original curriculum was "disjointed" and followed the following general format: freshmen--general leadership education; sophomores--counseling processes; juniors--training processes; seniors--open leadership discussions. The new leadership curriculum is structured around the following format:

Freshmen--Followership Model--the development of principles of Dr. Steven Covey's "Seven Habits."

Sophomores--application of Deming's principles and quality methodology on an actual Naval Academy problem.

Juniors--Covey's principle-centered leadership for the development of higher level counseling and training preparation techniques.

Seniors--a capstone course where the seniors actually train their subordinates in the leadership model.

Specific departments or disciplines have adopted quality education initiatives to different degrees. The Leadership/Professional Development department has spearheaded the initiatives at the USNA. Recently the Electrical Engineering and Physics departments have decided to develop small scale test curriculums around similar total quality education methodologies used by the Leadership/Professional Development department. An interesting point to note is that the EE department has adopted these initiatives in part as a response to a cheating scandal. The physics department efforts were due more to the desire for overall quality improvement. The general attitude of the physics department has been noticeably more positive than that of the EE department, presumably due to the difference in the motivations for the change.

The institution does not currently offer cross-discipline or multi-discipline courses. However informal guidelines are to expand the curriculum to include these types of courses. Students participate in general curriculum or course development primarily through formal periodic feedback programs (discussed shortly). Guidelines for regulating student workload were developed using a time study of the student's weekly workload with the intent to balance professional time, fleet time, academic time, and personal time. Academic workloads for individual students however are not specifically limited.

COURSE DEVELOPMENT AND DELIVERY

The institution employs the following methods in individual courses to help students comprehend and apply total quality principles:

Outside employers (primarily Navy leaders) are invited to talk to the students to share their principles on quality.

Team teaching (defined here as sharing teaching duties with another instructor from the same department) is conducted--military with civilian instructors are paired up to team teach in order to provide a real-world focus on the perspectives in the civilian community.

Instructors from other disciplines or departments are invited to teach, but this is typically done on an informal basis.

Group discussion techniques and student team exercises, which incorporate the real life scenarios (actual USNA problems) are widely employed. One example is an actual seawall that was designed by the engineering students.

Currently there are no specific methods used to integrate and teach quality improvement methods (such as benchmarking or statistical process control) within various courses except within the leadership course. However plans are to take successful principles used in the leadership course and apply them to other areas of the USNA curriculum.

Other techniques they have found useful include the student leadership role. The strategic plan or aim of the USNA is to graduate midshipmen who are leaders (which may vary with the student's actual aims--such as getting good grades, or being able to go downtown on the weekends). The midshipmen leadership role (within the Brigade organization) is currently being used to communicate and align midshipmen aims with the Naval Academy's strategic aim--to graduate leaders.

FEEDBACK METHODS

Feedback from the students is obtained from the students using the following methods.

1. A daily evaluation (called a "PD Eval") is conducted within the leadership program and is done at the completion of each class. Other faculty throughout the school often use an informal process (5 minutes at the end of each class) for regular feedback.

2. Formal evaluations consisting of a computer questionnaire and written responses are done at the 6, 12, and 16 week points of the semester. These evaluations solicit feedback on areas including the specific instructor and the specific course.

3. Additionally a leadership/counseling critique is conducted by the freshmen class on the junior class leaders. The freshmen rate the juniors on various areas of leadership based on a 32-question survey. Any of the upperclassmen (juniors) can compare what he/she thought of his/her performance against the subordinates perception of him/her. An interesting point to note is that behavioral change has been observed and measured in the junior class leaders as a result of their seeing the freshman feedback.

Student academic feedback is seen specifically by all instructors and department heads, and is available to any parties that are interested. Student feedback results in change to the curriculum or courses at the end of each semester through an analysis of data charts (Pareto charts derived from student inputs) which is used to develop changes to improve the course structure and classroom instruction techniques.

Other than course grades and GPA, the institution does not have specific methods to measure how well the students are comprehending and applying total quality principles within their fields of study.

Feedback is solicited from the prospective employers of the graduates by periodic surveys; however, this area is not the respondent's area of expertise.

GENERAL ISSUES

According to Commander Beck the greatest success with the U.S. Naval Academy's efforts to enable students to comprehend and apply quality principles have been the process action teams in which the sophomore students are actually able to make system changes that affect the way the school is run.

The greatest disappointment according to Commander Beck with their efforts to enable students to comprehend and apply quality principles is that it takes time to make necessary changes.

Roadblocks encountered include alignment throughout the system. Specifically, thought processes and goals differ among the junior and senior management--this is essentially a communication problem.

Further improvements suggested by Commander Beck to better enable students to comprehend and apply quality principles is to further develop the student/faculty partnership. The intent is for the teacher to get with his/her students and determine the outcomes needed from the class. The teacher and students then work together to determine what needs to be done to achieve those outcomes. This represents a departure from the more traditional teaching style where the instructor presents the students with a course outline and immediately begins to teach the class (without student input).

Commander Beck also recommends that, to provide a proper foundation for change, process improvement at an institution should not be attempted without a specific theoretical approach (such as Deming or Crosby) as a model for institutional process change.

TELEPHONE SURVEY SUMMARY

NAME: Marie Jimenez

SCHOOL: University of Central Florida

POSITION: Ph.D. Student Graduate Teaching Assistant

PHONE: (407) 823-5356

DATE: 15 June 1993 TIME: 1200-1300

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Two formal classes specifically dealing with the basic philosophy and tools of TQM are offered; one is designed to be at the graduate level and one at the undergraduate level. The TQM courses offered by the Industrial Engineering department are not mandatory/core courses. They do not focus on a particular advocate or approach, but introduce a cross-section of philosophies.

In her position, Ms. Jimenez did not have an intimate knowledge of the curriculum or course development process. She qualified her answer to some of the questions when she wasn't sure her answer was correct.

For example, she wasn't aware of whether or not the process followed at Central Florida has any formal guidance for curriculum construction and content. The informal guidance she was aware of consists of using old syllabi as guides for developing new courses subject to the inspection and approval of the appropriate review committees. No specific considerations for teaching students how to comprehend or apply total quality principles exist, to her knowledge.

Ms. Jimenez was not aware of any changes made to the general curriculum structure to teach students how to apply total quality principles.

The Industrial Engineering department is the only department which has adopted quality education initiatives. Ms. Jimenez feels it is too soon to tell what the results will be as the initiatives have only really begun in the past year.

The institution does not yet offer cross-discipline or multi-discipline courses, but they are being considered.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses.

Students do not participate in general curriculum or program development.

There are no guidelines for regulating student workload.

COURSE DEVELOPMENT AND DELIVERY

There have not yet been any dramatic changes to any courses to teach students. The changes have primarily been to internally improve the department's instruction. The actual course changes have been left up to the instructor.

The university does not invite outside employers (business leaders, CEOs) to talk to the students in the classes on TQM, but does invite outside employers in other classes.

A few of the courses use team teaching.

Instructors from other disciplines or departments are not invited to teach.

Group discussion techniques are employed.

They do not use lesson plans developed by prospective employers.

They do use student team exercises and real life scenarios. Some quality improvement methods are integrated and taught within various courses.

Other techniques they have found to be used is a tools orientation in the Quality Assurance, Management, and Reliability classes. The philosophy, or TQM as a whole, is really only seen in the two survey classes. In the other Quality oriented classes, the use of the tools is emphasized and the philosophy is not stressed (again, Ms. Jimenez qualified this answer as she was not sure her information was current).

Specific courses have adopted quality education initiatives more than others as the instructors see fit. There is no formal guidance. The real initiative of the Industrial Engineering Department is the agreement of the 15 instructors to adopt an expanded student feedback system to continuously improve their own instruction.

Traditionally, students have not participated in course development. A pilot project, started last spring, is an attempt to formally include student feedback in the educational process. Their inputs may eventually be incorporated, but it is too soon in the process for any

impact to be noticed on course development. This pilot project grew, partially, out of Ms. Jimenez's experiences with her class last fall (see below).

FEEDBACK METHODS

Traditionally in the Industrial Engineering, feedback has taken the form of an end-of-course questionnaire.

This last spring, a pilot project was initiated where a faculty-designed critique was used to measure student perceptions about the instruction they were receiving.

Some of the stimulus for the faculty's decision to initiate the project came during the previous fall semester when Ms. Jimenez taught an engineering economics class. She gave an open-ended (blank sheet) questionnaire near the middle of the term on which the students were encouraged to respond with their perceptions about the course. Initially, she intended to determine whether or not her students understood the material and whether or not she was presenting it effectively. It expanded, though, into a collaborative process where the students started taking a real ownership of the process, and she was asking for their input about every 2 weeks. Primarily when they saw that she adopted several of their suggestions, the student's attitudes changed dramatically. A group of 10 students volunteered to act as a committee to help her review comments and suggest improvements to the course. She also noted that students seemed to ask more questions about the material covered in class. In the interview, Ms. Jimenez wanted to emphasize that the result was different than just an elaborate feedback system, but rather the whole tone of the course changed--and very positively, in her opinion--both from her perspective and from that of the students'. She believed that the students learned more because they were more involved and much more interested.

Last spring, the Industrial Engineering Department constructed a numerically scaled, 12-question critique. The questions were generated from an open-ended questionnaire given to the students. The structured questionnaire was developed by the faculty as part of an effort to use the student feedback to improve the instruction given in their classes. The critique was administered during the spring semester. Some of the suggestions were implemented immediately, depending on the professor. The answers were analyzed for significance, and during a follow-up interview (22 July 1993), Ms. Jimenez tentatively reported that approximately two thirds of the changes that were made in courses resulted in a positive change in student satisfaction in the course. Students reported improvements in 11 out of 12 areas, while the 12th remained constant.

Traditionally, specific areas in which student feedback has been solicited include: the instructor and the course. Student"s comments about other subjects have not been evaluated consistently. However, Ms. Jimenez notes that, on the forms, "the students will always start talking about the other items." The general opinion among the students about the forms was that nobody looked at them.

The forms are, in fact, very important in the department for consideration of faculty for tenure or promotion. However, students do not see this result.

Traditionally, student feedback is seen by the instructor and department chairman. During Ms. Jimenez's class in the fall the students saw the results and graphical analysis of the comments. Some of the discussion revealed that particular criticisms had merit and that some did not.

Student feedback has resulted in change to the curriculum or courses based on the instructor's judgement as to degree and nature of the changes.

The student did not have the opportunity to see the result or effects of the feedback in the traditional feedback system. They did in the fall class taught by Ms. Jimenez. In the spring pilot project, they saw presentations of the results of the feedback, and, depending on the instructor, some effects of their feedback.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study. The program now is focused on changing and improving the instructor's performance and not on improving the student's ability to comprehend and apply total quality principles.

Ms. Jimenez does not know whether or not feedback is solicited from the prospective employers of the graduates. She does not know if employer feedback is seen by anyone or whether employer satisfaction has changed.

GENERAL ISSUES

According to Ms. Jimenez, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles was being able to show some reluctant or cynical students and faculty that the critiques could produce improvements.

The greatest disappointment with her efforts to enable students to comprehend and apply quality principles is when

it was apparent on the last survey that some students never understood what she was trying to do.

Roadblocks encountered include Faculty attitudes. The reluctance to change was a powerful obstacle to overcome in implementing the Industrial Engineering project consisting of the new survey forms and commitment to continuous improvement based on feedback. "If the instructor won't buy it, how will the student?"

Processes that were found to be ineffective or impractical include the original efforts to strictly adopt an industry-oriented TQM process into the academic environment. It proved to be very difficult to match processes without major modifications. That program was TQC (total quality control) and was introduced by a faculty member who also works as an industry consultant.

Further improvements that she would like to make to enable students to comprehend and apply quality principles in their fields of study would be to have the entire school adopt the initiatives, rather than just the Industrial Engineering Department.

TELEPHONE SURVEY SUMMARY

NAME: Dr. William Swart

SCHOOL: University of Central Florida

POSITION: Professor and Chairman of Industrial Engineering

PHONE: (407)823-2204

DATE: 24 May 1993 TIME: 10:00 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement are offered. Two courses are offered by the Industrial Engineering department. The upper level one, intended for graduate students, is a mandatory course for the Master's in Quality degree. For all others it is an elective. It does not focus on a particular advocate or approach.

The institution does not have any formal guidance for curriculum construction and content but they do have a formal construction process with an Industry Advisory Board, faculty, and student representatives in Academics. This guidance does not contain specific considerations for teaching students how to comprehend or apply total quality principles.

Changes made to the general curriculum structure to teach students how to apply total quality principles include applying Total Quality into the Quality Engineering course as a requirement for undergraduates and for a Master's degree in Product Assurance.

The Industrial Engineering department has adopted quality education initiatives more than others with the following results: Industrial Engineering was chosen to lead an effort by the entire engineering school to compete for a grant from AT&T. Twelve of the then 25 faculty--in this effort--agreed to adopt a project where TQM concepts of continuous improvement were adopted. The faculty developed an expanded feedback system and began using it to make substantial changes in their instruction.

The institution does not offer cross-discipline or multi-discipline courses, but engineering students are

required to take some courses in different departments. All engineering students are required to take some course in Quality.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses. Individual departments approve specific courses for their students.

Students do not participate in general curriculum, program, or course development.

Guidelines for regulating student workload are programmed into an automated Expert System Advisor. This computer program was developed by the university and is used like an actual advisor. If the student attempts to take a course which conflicts with something else or exceeds the limited course hours, the Advisor warns him/her of the mistake and prevents it.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles include the basic statistics course to include TQ tools. This change developed in the last year or so. In the Industrial Engineering Department, the project to include continuous improvement has led to an atmosphere of cooperation and sharing. The ideas are being refocused on the processes, rather than on personalities and that has been the key, in Dr. Swart's opinion, to opening up the communication flow between faculty.

The institution employs the following methods to help students to comprehend and apply total quality principles:

Rather than invite outside employers to talk to the students, videotapes are used which are prepared by outside employers to communicate the selected message.

Team teaching is being used in the Concurrent Engineering class for the first time.

Instructors from other disciplines or departments are invited to teach but not regularly, and normally as guest lecturers.

Group discussion techniques are used.

Lesson plans developed by local industry have been used in courses and so have lesson plans from the Naval Training System Center.

Yes, they use student team exercises.

Real life scenarios are sometimes used. Projects needed on campus are looked at and the results are submitted to the suggestion program.

Quality improvement methods are used within various courses including real life problem solving techniques, teamwork building techniques, and statistical process control. Beyond the tools, benchmarking is used at all levels in the whole department in support of the continuous emphasis.

Quality education initiatives have been adopted relatively across the department. Some instructors have individual differences.

Students do not participate in course development.

FEEDBACK METHODS

Feedback from the students is obtained through a survey designed to improve the classroom processes.

Specific areas in which student feedback is solicited include the specific instructor and the course. The feedback is designed to gather information about the processes that the instructor owns; specifically direct communication (verbal and non-verbal), evaluation procedures (testing and homework), and classroom conduct (organization and body language).

Student feedback is seen by the faculty. Since the start of the project, Pareto charts have been made in an effort of process analysis. Metrics of the results are being developed right now and a reemphasis is planned in the coming fall semester.

Student feedback has not resulted yet in change to the curriculum or courses. The feedback is being used, at least until some metrics are developed, to develop issues for change, prioritize them, and help to analyze the selected process. The degree of change determines whether the change is to a specific course or to the curriculum of a discipline.

The students are only starting to have the opportunity to see the result or effects of the feedback in action, mostly because the system is quite new. Administrators discuss the results of the critiques with students and some are enlisted to aid in the process. The improvement in cooperation among the faculty is hoped to provide a positive example, also.

The institution measures how well the students are comprehending and applying quality principles within their fields of study through traditional testing of quality-related material.

Feedback is solicited from the prospective employers of the graduates, but Dr. Swart wishes it could be even better. Formal exercises are conducted with prospective employers to solicit input, about desired qualities in future employees. But the feedback is gathered on an Ad Hoc basis. The Industry Advisory Board is another source of input through its role in curriculum development.

The employer feedback is seen by the faculty and department heads.

The employer feedback results in change to the curriculum or courses through the input to the curriculum committee.

Changes in employer satisfaction with the university or with the students have not been noticed, due to the recent development of the initiatives.

GENERAL ISSUES

According to Dr. Swart, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles is the coaching and facilitation role the department has played in helping the Kennedy Space Center to develop its own Industrial Engineering Department (which, he says, may only be coincidental with the development of the TQM initiatives).

The greatest disappointment with their efforts to enable students to comprehend and apply quality principles is the lack of realization that there is a difference between a <u>good concept</u> and a <u>good practice</u>. He believes that a specific professor of TQM is unnecessary. His idea for success is to have the involved professors make the changes themselves, as best they can, and improve from there.

No significant roadblocks were encountered and he reports no major disappointments. Some ideas were better than others, but they all helped further the process.

Further improvements that Dr. Swart would like to make to enable students to comprehend and apply quality principles in their fields of study include just continuing down the path that they have started.

TELEPHONE SURVEY SUMMARY

NAME: Victor Prybutok

SCHOOL: University of North Texas

POSITION: Director, Center for Quality and Productivity

PHONE: (817)565-4767

DATE: 24 May 1993 TIME: 2215 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement concepts are offered. The course offered by the Business School is a mandatory/core course for certain majors; Engineering Technology for undergraduates and for an MS in Quality Engineering. It does not focus on a particular advocate or approach.

The institution has formal guidelines for curriculum construction. Each college in the university has formal guidance on content from their accrediting body (ASCSB for the School of Business). Guidance is provided from the top down by accreditation and, informally, from the bottom up by department expertise. This guidance does not contain specific considerations for teaching students how to comprehend or apply total quality principles. The University core curriculum does not incorporate Quality yet; however, there is new guidance for the Business school core to contain instruction in quality.

Changes made to the general curriculum structure to teach students how to apply total quality principles include incorporating a statistical process component into the statistics curriculum and introducing Quality into the Management Science program.

The College of Business has adopted quality education initiatives more than others with the following results: A Ph.D. degree concentrating in Quality and Reliability is offered, the center for Quality and Productivity was established and puts out a publication, both management and management science (more quantitative) departments have been established.

The institution does not offer cross-discipline or multi-discipline courses, formally. A graduate course in Quality Control emphasizes both quantitative and non-quantitative techniques. The College is also moving towards an undergraduate business course with an emphasis on quality as an elective.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses. The concept is pretty new for the College and hasn't been explored fully.

However, the dean encourages the idea and gives full credit for the course for both professors teaching a multi-disciplinary course for the College of Business (solving an oft-heard problem of apportioning the credit).

Students do not directly participate in general curriculum or program development. Some input is assumed through the formal feedback system and traditional course critiques for undergraduates. Graduate students have a much greater impact through their selection of courses to match their specific needs. The university is more responsive to them because they can fill some teaching duties and are perceived as having more ability to contribute to the research being conducted by the institution. Graduate students, then, have more of a role in developing courses and in the ownership of a program.

The Center for Quality and Productivity operates through student volunteer activity and has heavy student involvement. It serves various internal and external customers in the Denton TX region.

Guidelines for regulating student workload exist at the Ph.D. level but they are informally not honored. The students typically do more in order to advance their career, research, finances, or all three.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles include a Quality Control course which was changed from a Statistical Control course. It now incorporates the use of large scale projects, and advanced Quality Control techniques.

One interesting effort was a paper competition. Run by the university, it was actually funded by the American Society of Quality Control (ASQC). The subject was the application of a quality methodology in a real scenario. The best paper won a $1,000 prize, and second place won $500.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They invite outside employers (business leaders, CEOs) to talk to the students.

They are just starting to use team teaching.

Instructors from other disciplines or departments are invited to give presentations - but not to stay too long.

Some efforts have been made to employ group discussion techniques. One problem is that it is hard to give non-traditional classes structure.

Lesson plans developed by prospective employers are not really used. Employer feedback is generally directed at the curriculum. Ideas from employers are adopted by the informal centers for Information Systems and for Quality and Productivity.

Student team exercises are used in the Quality courses. Real life scenarios are also incorporated when students get project ideas from real life problems or from quality improvement ideas for the University. The use of large scale projects is emphasized to make the situations more realistic for the students.

Quality improvement methods are being implemented and taught within various courses. The focus is on teamwork and solving real-life problems.

Other techniques they have found useful include the traditional lecture.

Specific courses have adopted quality education initiatives more than others - primarily the courses on quality; with the following results: students have assessed the university's Quality Improvement processes. They recommended a structure to go further. The Quality courses are largely a success, overwhelmingly in the students' opinion.

One interesting lesson learned is that the Ph.D. students needed much more direction than was expected by the instructor. They were good at functioning individually, but were much less competent at working in teams. Dr. Prybutok hypothesized that individual behavior is something they have been rewarded for all their previous academic careers. For example, the Ph.D. students involved in working with the large scale projects of the Quality Control course were given a choice between working separately or as a team. They chose to work individually.

Students participate minimally in course development by the traditional course critique. Ph.D. students, by virtue of their academic interests, exert a lot of impact on the graduate programs through their enrollment choices (voting with their feet).

FEEDBACK METHODS

Feedback from the students is obtained from the students using the formal Course Evaluation Process. Students are reluctant to be honest. Daily input is considered difficult to receive.

Feedback is solicited at the end of every course. Department heads, the administration, and the faculty see the critiques. A summary of an instructor's critiques plus a list of individual comments is kept. The instructor is held responsible to maintain their file.

Specific areas in which student feedback is solicited include the specific instructor and the specific course.

The role of student feedback in causing change to the curriculum, or to courses, is generally instructor dependent.

The student does not have the opportunity to see the result or effects of the feedback in action.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study. However, test material reflects the general level of comprehension and, mostly at the graduate level, project team presentations reflect the team dynamics.

Feedback is solicited from the prospective employers of the graduates by the use of Advisory Boards and by employers recruiting through the Information Systems Research Center. Corporations join for a fee to screen the university's graduates.

The employer feedback is seen by the Dean, Chairman of the faculty, the Advisory Boards, and by the students only when it results in a change to their program.

The employer feedback results in change to the curriculum or courses through the following process. Indirectly, as the university recognizes a need to respond to the changing concerns of society as reflected by the employers' changing requirements. And directly, when the

corporation cares enough about the university making a change that it gives the school a large grant of cash to implement the change right away. (If you really cared, you'd send cash.)

Changes in employer satisfaction with the university or with the students have not been noticed, because Dr. Prybutok has only been there for two years.

GENERAL ISSUES

According to Dr. Prybutok, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles is the resulting efforts in improved research of the Ph.D. students.

The greatest disappointment with their efforts to enable students to comprehend and apply quality principles is the amount of direction that the PhD students needed to work together as a team--it was significantly more than the MBA students.

Roadblocks encountered include some students desire to have a more structured (familiar) course.

Processes that were found to be ineffective or impractical include large teams/projects in large classes. They were too hard to manage.

Further improvements that Dr. Prybutok would like to make to enable students to comprehend and apply quality principles in their fields of study include further refining the team process and conducting large, on-going projects for the students which don't necessarily neatly end at the end of the course.

TELEPHONE SURVEY SUMMARY

NAME: Gregory Bazinet

SCHOOL: University of Southern Maine

POSITION: Assistant Professor of Technology

PHONE: (207) 780-5440

DATE: 20 May 1993 TIME: 0830 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

A formal class specifically dealing with quality improvement concepts is offered. The TQM course offered by the Industrial Technology department is a mandatory course for majors. It does not focus on a particular advocate or approach. It features a matrix of Quality approaches organized contemporarily, from past to present, including a bibliography of the writings.

The institution does not have any formal guidance for curriculum construction and content, other than what is required by the accrediting standards. This guidance does not contain specific considerations for teaching students how to comprehend or apply total quality principles, but does require "good practices" of Industrial Technology, emphasizing "people, process, product."

Changes made to the general curriculum structure to teach students how to apply total quality principles include the institutionalization of feedback from students and employers in the development process.

Specific departments have adopted quality education initiatives more than others. The schools preparing their students for direct employment into a profession--training them--have adopted quality initiatives more than others: The nursing, business, and applied science schools are the best examples. They have done so because TQM directly supports their goals of responding to the prospective employers' concerns, and it offers their graduates better opportunities for employment. It is mutually beneficial to the students, the school, and the employers.

The institution does offer a very interesting and unique multi-discipline courses called Global Enlightenment.

Three instructors; one a Scientist, one a Social Scientist, and one a Philosopher, discuss the important concepts and issues of the world. The different viewpoints expressed are intended to give students a broad, divergent picture of reality, allowing the student to decide for himself. This is a core course for all students.

The institution does not have formal guidelines to teach across disciplines or offer multi-disciplinary courses but the university is committed to the idea and has very many multi-discipline courses.

The student body is not typical. There are about 10,000 students enrolled, but only about 600 live in the dorm. The rest are commuters. The average age is 26-27. A lot of the initiatives in generating student involvement take advantage of the older, more experienced students.

Students participate heavily in general curriculum or program development. A proposed curriculum is shown as a skeleton to a curriculum committee made up of junior and senior students. Students from each program are invited to comment, including on the textbooks listed for the course.

There are no formal guidelines for regulating student workload.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles have occurred as a result of refocusing on who will actually benefit from the instruction; primarily the student and the future employers, and not the teachers. The changes made because of this shift in emphasis have resulted in higher quality work from the students.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They occasionally invite outside employers (business leaders, CEOs) to talk to the students, especially for the afternoon and evening classes when the speakers are more likely to be available.

Team teaching is regularly used.

Instructors from other disciplines or departments are invited to teach. One highlight of this technique is the resulting validation of prior learning when students see a professor come in and reapply the previous material effectively to the current problem.

Group discussion techniques are used extensively. One favorite of Dr. Bazinet's is to split the class into

different groups, with one group presenting a topic; the next group defending the given position; and the third group criticizing the position. The point/counter-point argument stimulates student involvement and subsequent retention of the material.

Lesson plans developed by prospective employers are not used.

Student team exercises have been used for many years at the school. One of the problems was convincing faculty that evaluating teamwork was possible and effective. Explicit goals and honest communication in the peer evaluation process (students rate themselves) among students have been essential to success.

Real life scenarios are actively integrated into coursework in many classes. Teams are formed and used to develop solutions to open-ended problems. Tools developed in the TQM courses can be used plus any others found by students. The teacher acts as a consultant.

Quality improvement methods are integrated and taught primarily within the courses devoted especially to TQM: Including real life problem solving techniques, benchmarking, teamwork building techniques, and statistical process control.

Other techniques they have found useful include the scientific method emphasizing the plan, do, check, act cycle; and the use of fishbone charts to help analyze traditional methods of evaluation. The methods of evaluation are being studied to determine why the education process is producing the observed results.

Specific courses have adopted quality education initiatives more than others, specifically when they are part of a discipline where the future employers are using these techniques.

The results are that these programs have a better relationship with these future employers. Programs which have not adopted these initiatives are represented by the attitude that they are not looking for change, prior examples are still valid, the way things have been done is still the best, and they prefer to stay "out of the loop" of change.

Students do participate in course development, but Dr. Bazinet wanted to emphasize that it was a faculty dominated process. It was the faculty's initiative to develop courses, and they could accept feedback if they wished.

FEEDBACK METHODS

Feedback is obtained from the students. Dr. Bazinet described some of the techniques he used for obtaining and using student feedback for video courses he teaches over a statewide network, as well as for classes conducted for students physically there.

At the start of each session, he allocates an open time of about 15 minutes for student comments. When he is teaching over the air, he advertises a fax number and takes comments that way. Additionally, he makes an effort to highlight material suggested by students and use it as soon as possible in the class. One way to stimulate interest in this is to give credit for the ideas over the air. For example, this was recommended by "Bill." Dr. Bazinet cited Juran's Spiral of Quality as ideas stimulated more ideas and increasingly changed and improved the course.

Specific areas in which student feedback is solicited include the specific instructor (does he/she cover the stated goals, was he/she willing to listen) and the specific course (did it deliver what it proposed). Feedback about the course is used as a mirror of the department's performance.

The university educational environment is considered in general and indirect terms. It is not asked about, specifically.

Student feedback is collated and seen by the department dean, the department chairs (who retain a copy), and, lastly, the faculty (if the feedback is unsigned it can be discarded here. Signed, written copies are entered into a professor's permanent record). It would take at least 3-4 cycles of poor feedback to remove a faculty member.

Student feedback does not result in change to the curriculum. It is much more likely to result in changes to courses through solicited feedback. A change in a text identified as old is something that can be implemented quickly. Things which take a commitment of funds, such as improved classroom computers, may take much longer.

The student does not have the opportunity to see the result or effects of the feedback in action. Dr. Bazinet considers this to be a hole in his university's feedback process.

The institution measures how well the students are comprehending and applying quality principles within their fields of study only by traditional methods when the material is included in a class. Dr. Bazinet is trying some

techniques where he compares his students' ability to use TQM tools before and after they are used in projects. He provides a comment sheet on feedback forms specifically for Quality tools.

Feedback is solicited from the prospective employers of the graduates. The TQM advisory board sat with a group of major regional corporate employers about 18 months ago and asked them what they were looking for in the employees they hired. The representatives emphasized that graduates should be 1) articulate, 2) proficient writers, 3) able to understand people, 4) able to "hit the ground running", 5) able to ask for help before getting in trouble, and 6) should have a liberal education background with a focus in some specific area. Getting these recommendations from the corporate representatives impressed the school's administration. They have supported the efforts to adapt the curriculum to fit these needs.

Juniors and seniors are often hired by employers for special projects. They bring skills to the company, evaluate the effectiveness of their own education, and still return to the university to relate their effectiveness to the other students. The school is consulted with in this process by the employer also to find out how proficient the employer thought the student was and to find out if the university considers (teaches) the qualities that the employer thinks valuable.

The employer feedback is seen directly by the Chair of the curriculum committee, and indirectly, by the entire faculty. Employers of graduates are asked how the graduate compares to other recent hires.

The employer feedback result in change to the curriculum or courses through the curriculum committee's and faculty's review and consideration of the feedback. The decision to make any changes still rests with the responsible faculty. A course's syllabus must be submitted annually to the Provost (chief academic officer), who, along with the faculty member, must balance whether the course fits the curriculum's goals versus the faculty member's academic freedom to create his/her own course.

There have been big changes in employer satisfaction with the university and with the students. Recent graduates have been very well-placed due to their superior ability to work with other people on technical projects. Rather than being used as entry level engineers, for example, they are put in positions of organizing people and articulating the goals of the organization because they have demonstrated the ability to do so. The graduates' number one advantage is

the level of their communication skills. They have learned - as a result of the TQM innovations in their curriculum - teamwork, two way communication--including an ability to accept criticism, and they understand their responsibility to defend the people working for them.

GENERAL ISSUES

According to Dr. Bazinet, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles is the level of employment of the graduates, both in a high rate of employment and in the positions of responsibility they have earned.

The greatest disappointment with their efforts to enable students to comprehend and apply quality principles is that there is not enough time to teach more students, that there are not enough instructors willing to teach the concepts, that so many instructors see it as another thing to do, and that the instructors consider themselves teachers of a discipline and not as teachers of people. [*His favorite example, a professor of philosophy referring to TQM advocates, "I don't like the way they think."*]

Dr. Bazinet has encountered no roadblocks worth reporting. He has found support from many sources, including Dr. Juran, ASQC (American Society of Quality Control), and Federal Express (a Malcolm Baldrige winner and major local employer).

Processes that were found to be ineffective or impractical include teaching statistical process control over the video courses. That was difficult without the feedback of physically present students tc gauge understanding.

Further improvements that Dr. Bazinet would like to make to enable students to comprehend and apply quality principles in their fields of study include inviting business leaders to appear in seminars where the students get to interact with them and ask directly if what is being taught to them will be useful in the employer's company.

TELEPHONE SURVEY SUMMARY

NAME: William C. Parr

SCHOOL: University of Tennessee

POSITION: Director of the Center for Advancement of Organizational Effectiveness

PHONE: (615) 974-8326

DATE: 20 May 1993 TIME: 1600 (EST)

INTERVIEWER: Bond

GENERAL CURRICULUM DEVELOPMENT

The MBA program offered by the management department is a degree program course. It does looks at several approaches but slightly favors Deming.

The MBA program has formal guidance for curriculum construction and content and contains specific considerations for teaching students how to comprehend or apply total quality principles. A White Paper for the program describes guiding principles for the development of pedagogy, principles for how to evolve content, principles for deciding the appropriateness of the content. Faculty members do not individually decide what they are going to teach in their course. Curriculum is designed through a group process that involves 15 core faculty.

Changes made to the general curriculum to teach students how to apply total quality principles include reorganizing the entire course structure. The first year of the MBA program (also called the "core" year) is team teaching and case study oriented. The second year encompasses a more traditional MBA classroom approach. The first year is composed of a completely integrated holistic curriculum structuring the MBA curriculum into two courses of 15 credit hours each (for a total of 30 semester hours for the MBA). The class meets for three hours a day five days a week. During this time different instructors are invited to present various lessons in their areas of expertise such as: finance, management, customer values, international market strategies, systems, and market opportunities. Students work in teams of four to six and will conduct projects together for the semester. Teams will present their project work to the faculty and to industry executives.

An integral part of the program involves "discovery learning," a reversal of the more traditional aspect of first telling students what they need to know and then applying that knowledge; instead the approach is to have students attempt to solve various problems to determine what it is they need to know. This in a sense mirrors the method that the MBA faculty operates in their exploration of better teaching techniques.

The new MBA program is a pioneer program for the University of Tennessee. Preliminary results are encouraging. Publications such as Business Week and U.S. News and World Report rate the new program highly. Companies such as Xerox and Proctor and Gamble are now recruiting graduates from the MBA program. Other departments in the school, including the Education Department and the Engineering Department are beginning to adopt a similar direction. Also instructors that teach courses for the MBA program have restructured the way they teach courses outside the MBA program along similar teaching techniques.

The MBA program itself is highly interdisciplinary with emphasis on business and strong links to engineering. Instructors from other departments are involved in the curriculum construction and the lesson delivery. While the seamless structure of the MBA program (first year) makes it difficult for students from other programs to take particular MBA classes, the institution as a whole does offer a wide range of courses that are cross-listed between various departments.

Students participate in general curriculum or program development through the following ongoing focus groups conducted at the end of the semester and throughout the year. Management faculty meets weekly for an hour and a half to discuss curriculum. A student representative is invited to speak for the students. Also student run "town meetings" are conducted once a month in which faculty representatives are present to discuss and deal with curriculum related issues.

Since this MBA program is new, guidelines for regulating student workload are currently under study and, is subjective. Workload is jointly decided by the faculty as opposed to the individual instructor.

COURSE DEVELOPMENT AND DELIVERY

Course content during the first year of instruction is devoted solely to what all students need to know (content is determined by faculty consensus). It is conducted using the innovative team teaching style and case study method. The second year instruction then branches out into more individualized student requirements and is conducted along the more traditional classroom format. This order of this delivery method was chosen to build the framework and thought content first. It also has the practical advantage of requiring fewer instructors than if the order of the instruction methods were reversed. The overall delivery method also better suits the needs of future employers who are looking for MBA graduates with functional specialties in particular areas. Finally, the students who have been exposed to the more innovative techniques during the first year are actually influencing the classroom environment during the second year.

The institution employs the following methods to help students comprehend and apply total quality principles. Outside employers (business leaders, CEOs) are frequently invited to talk to the students (at least once a week). These outside employers will sometimes deliver presentations to the students and sometimes hear presentations given by the students. Team teaching is conducted extensively using instructors from the same department, other departments, as well as, instructors from different colleges. Lesson plans and course material are devised using extensive consultation with prospective employers. Extensive use is made of group discussion techniques, student team exercises and real life scenarios. The MBA program also integrates and teaches quality improvement methods within various courses including teamwork building techniques, prioritizing tools, benchmarking, statistical process control, and quality function deployment--integrating and teaching these techniques is an area of emphasis in the curriculum.

FEEDBACK METHODS

Feedback from the students is obtained using a variety of methods. Every lesson or session when the students meet (either on or off site), one member of the team (on a rotating basis) will fill out a feedback form which consists of numerical ratings and verbal comments. This method is used to pulse the curriculum to ensure that there are no glaring problems. Twice a year a broader-scoped feedback is solicited from each student on the specific instructor, the specific course, the specific department, the entire curriculum, and the university educational environment. The "town meetings" also provide a less formal but very

effective personal feedback interaction between the instructors and the students.

Of these feedback methods, the ones that were found to be the least effective and least useful were the numerical rating systems, since they gave very little clue as to how to improve and also induced competition which is not considered useful in this context. On the other hand, open ended questions such as:

> What is the most important thing that you had to work on?
>
> What were some of the major deficiencies?
>
> What is the thing that you feel you still don't understand?

were found to be the most helpful. Student feedback is made available to all the MBA core faculty.

The institution does have specific methods to measure how well the students are comprehending and applying quality principles, including: individual written tests are used to determine knowledge and comprehension levels; major projects or "milestones" are used to determine how well the students have captured quality improvement methods; team functionality or how well members of the team function as a group is also used to measure how well the students apply quality principles.

Feed forward (inputs for curriculum design) and feedback (how well the graduates are performing) is solicited from the prospective employers of the graduates by formal and anecdotal means. Formal written feedback on each of the graduates is obtained at the end of the graduates' internship to determine how well they performed, what are their strengths and weaknesses, etc. Verbal feedback is also solicited whenever corporate representatives visit the institution. The employer feedback is seen by core faculty and is voluntarily made available to the rest of the institution.

Employer reaction with the new MBA program seems positive, although it is important to note that the first class (under the new program) is just now graduating and the results of the changes are still too early to determine.

GENERAL ISSUES

According to William Parr, the greatest success with the institution's efforts to enable students to comprehend

and apply quality principles is the student's ability to creatively work together and to apply principles in an "integrated" way.

Roadblocks encountered include some lack of administrative infrastructure support (to parallel initiatives made by the faculty); however, faculty support is very good.

One process found to be ineffective or impractical is "preaching" quality principles to the students. Also, it has been found more effective to present the challenge to the students before instructing the methodology, rather than to instruct methodology first and then give them the challenge. This sequence has been found to provide students with a greater appreciation for, and a better ability to retain, the methodologies.

Further improvements that William Parr would like to make to enable students to comprehend and apply quality principles include integrating material further, to apply closer links with technology (e.g. inviting Apple Computer to discuss how to apply some very high tech educational technologies).

One question that Mr. Parr feels is important to ask is "why would any one want to do a program like this?" In other words, the time-intensive nature of the work involved to create effective change, and the fact that these measures do not provide a "quick fix" solution are issues that must be addressed before an institution attempts to embark on a program of this nature.

TELEPHONE SURVEY SUMMARY

NAME: Larry Haugh

SCHOOL: University of Vermont

POSITION: Professor and Director of Statistics

PHONE: (802) 656-4350

DATE: 20 May 93 TIME: 0930 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement concepts such as Statistical Process Control are offered. The course offered by the Statistics Program is a mandatory/core course only for graduate students in statistics. It does not focus on a particular advocate or approach, but provides an introductory overview of the philosophy, surveys all of the basic tools, and emphasizes the statistical tools of TQM.

The institution does not have any guidance for curriculum construction and content, but each department and college does have a standard approval process. This guidance does not contain specific considerations for teaching students how to comprehend or apply total quality principles.

No changes have been made to the general curriculum structure to teach students how to apply total quality principles.

Specific departments or disciplines have adopted quality education initiatives more than others. The Statistics program and the School of Business have faculty members who are active in trying to bring the Total Quality concepts into their curriculum. One team-taught course has been developed by the faculty of several departments in the Division of Engineering, Mathematics and Business Administration. No formal Quality improvement procedures exist. Quality methods are seen as a good direction to be headed, for planning purposes.

The institution does offer one cross-discipline or multi-discipline course, Concurrent Engineering and Manufacturing Management is team-taught by volunteers as an

experiment in TQ. There are 8 faculty involved: 1 statistician, 2 mechanical engineers, 4 business faculty, and 1 independent design consultant.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses. The administration publicly says it is a good idea, but does not go out of the way to provide support for the execution. The burden is on faculty initiatives. This involves extra work, but no extra compensation. When the class is cross-listed, the listed faculty and department get the credit for offering the course. Funding is tied to student enrollment in the department. This constraint will likely grow more pressing in the future as funding is constricted for the University.

Students do participate in general curriculum or program development through various Advisory Councils of Students (e.g., for the College of Engineering and Mathematics), but Professor Haugh is not sure how much input they have and suspects that the participation may be general and partly social.

There are no guidelines for regulating student workload, other than the tuition credit charge system. Certain standards exist only for the purposes of defining eligibility for financial aid.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles include the experimental team-taught Engineering Design, as well as continuing improvements in the BSAD and STAT quality courses.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They occasionally invite outside employers (business leaders, CEOs) to talk to the students, but emphasize outside technical people who are working in the fields that graduates are most likely to be involved in. The Statistics Program has invited several well-known TQM professionals. The Business school has a regular seminar series and at least one marketing manager has been invited to speak.

Team teaching is not often used per se, but in the one pilot project class, some of the volunteer instructors are from the same department.

Again, instructors from other disciplines or departments teach in the pilot class and the problem exists

of giving credit only to the listed professor and department.

Group discussion techniques are used for graduate students, and for undergraduates in certain classes.

Lesson plans developed by prospective employers are not used/incorporated.

Student team exercises are used in the pilot Engineering Design class.

Examples in many classes are taken from real life scenarios.

The integration and teaching of quality improvement methods within various courses is limited to the pilot Engineering Design class, the Business and Statistics quality control courses, as well as a one-credit Statistics course developed in TQM.

Other techniques they have found useful include a one time offering of a 1 credit special course (just mentioned), where teams of students worked with companies and UVM departments on problems the organizations shared with them.

Specific courses have not adopted quality education initiatives more than others. Total Quality initiatives do not seem to have permeated the rest of the courses but are being tried out in the other introductory Statistics courses and in the experimental team-taught Engineering Design.

Students do not participate in concurrent (modifying during the course)course development with, again, the exception of Engineering Design.

FEEDBACK METHODS

Feedback from the students is obtained from the students using the following methods: end-of-course feedback surveys and, depending on the program (e.g., Statistics), exit interviews with graduates, consisting of a separate evaluation form and a meeting with the department head.

Specific areas in which student feedback is solicited include the specific instructor, the specific course, the entire curriculum (but only in the exit interview), and the university educational environment: UVM sends out satisfaction questionnaires to alumni (Note: This is currently threatened by budgetary cutbacks). Graduate school feedback is handled separately.

Student feedback is seen by the instructor and the Department Chair, who keeps a copy of them. The critiques are relevant during consideration for promotion or tenure, as well as merit pay decisions.

Student feedback has not always resulted in changes to the curriculum. The feedback has led to some better use of specific instructional tools in individual courses.

The student does not have the opportunity to see the result or effects of the feedback. Because the feedback is anonymous there is no concern that the students should receive information about how the faculty views their feedback.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study.

Feedback is not solicited from the prospective employers of the graduates. Some information is gathered informally through contact with alumni. No direct or formal contact exists.

The employer feedback is seen by the individual faculty member who has contacted the firm.

Employer feedback does not result in direct change to the curriculum or to courses, but trends in the industry are watched and if employers start mentioning something, change is considered.

Changes in employer satisfaction with the university or with the students have not been noticed.

GENERAL ISSUES

According to Professor Haugh, the greatest success with the institution's efforts to enable students to comprehend and apply quality principles has been the team-taught Engineering Design.

The greatest disappointment with their efforts to enable students to comprehend and apply quality principles is that the students are often neutral or uninterested in Quality. Students don't know what is required on the job.

Roadblocks encountered include a perception that TQM is "soft stuff" and not appropriate for the sciences.

Processes that were found to be ineffective or impractical include problems with the team-taught class. The lessons were disjointed and the lectures were not tied to the product development project.

Further improvements that Professor Haugh would like to make to enable students to comprehend and apply quality principles in their fields of study include requiring more Process Control Concepts in the Introductory Statistics classes.

TELEPHONE SURVEY SUMMARY

NAME: Wallace Carlson

SCHOOL: University of Wisconsin-Stout

POSITION: Professor of Quality Technology

PHONE: (715)232-1145

DATE: 17 May 1993 TIME: 10:00 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

A formal sequence of classes, specifically dealing with quality improvement concepts, is offered. The courses are offered by the Industrial Management department. They are mandatory/core courses for some Quality Technology majors and electives or selectives for other majors. They do not focus on a particular advocate, but do focus on a particular approach. The ISO 9000 standards are the focus of the curriculum.

As opposed to formal guidance, the university administration allows the instructional staff significant flexibility in curriculum construction and content. Some corporations are invited, informally, to offer criticism on proposed curriculum developments. There is no guidance concerning content-related considerations for teaching students how to comprehend or apply total quality principles.

Each program director in the Industrial Technology Department is responsible for the changes to the curriculum. There are five programs in the Department, and all have incorporated some classes of TQM into their requirements. There is not a coordinated effort; however, to change the general curriculum structure to teach students how to apply total quality principles. Only in some of the curriculum are Quality courses mandatory, while in others they are electives.

The departments associated closely with technology have adopted quality education initiatives more than others due to the close relationship they have always enjoyed with industry. UW-Stout prides itself with having close ties to the business community and they have had this relationship for a long time.

A source in the UW system commented that it would not be reasonable to compare the relationship that UW-Stout has with industry to other schools in the system with more of a focus on liberal arts.

The result is that the graduates of the Industrial Technology Department have enjoyed a 98% placement in their field of study.

The institution offers cross-discipline courses by applying quality concepts in specific industry courses. Administratively, a satisfactory method to share credit for calculating faculty credit load which would enable departments and schools to offer multi-discipline courses has not been found.

The institution does not have administrative guidelines which would enable departments to teach across disciplines or offer multi-disciplinary courses. The only method available to offer multi-disciplinary instruction is to accept students from other disciplines - with the permission of their academic advisor - into their classes. The burden of discovery is on the student and their advisor.

Students do not participate in general curriculum or program development, although the student senate can make recommendations to the administration.

Dr. Carlson's opinion is that the students do not know the proper technical or disciplinary questions to ask to effectively participate in the development process because of their inexperience with the body of knowledge or its application.

There are only simple, basic guidelines for regulating student workload. Students may not take more than 18 credit hours without the permission of their academic advisor, and they must take at least 12 credit hours to be eligible for financial aid.

COURSE DEVELOPMENT AND DELIVERY

Changes made to particular courses to teach students how to comprehend or apply quality principles would best be characterized by adapting to an evolving technology. UW-Stout has always had a close relationship with industry, so as industry has increasingly adopted quality initiatives, so have the programs at UW-Stout. Emphasis on TQM principles (the industrial process, the role of employees as the chief source of improvement, and statistical methods), Juran's quality management, and the ISO 9000 standards are all increasingly emphasized.

The institution employs the following methods to help students to comprehend and apply total quality principles:

They invite outside employers (business leaders, CEOs) to talk to the students.

They do not use team teaching.

Instructors from other disciplines or departments are invited to teach, but only as a cameo appearance.

Group discussion techniques are employed.

Not specifically lesson plans, but Quality systems and curriculum construction developed by prospective employers have been used extensively. General Motors' "Target to Excellence," Ford's "Q-101," and Xerox's "Benchmark for Problem Solving" were given as examples.

Student team problem solving exercises are used.

Real life scenarios are often used form both industry examples and from actual university problems.

Quality improvement methods are generally not integrated and taught within various courses, but rather addressed directly in the courses on Quality.

Other techniques they have found useful include two noteworthy techniques: first, the students are encouraged to join student branches of Quality-oriented professional organizations, such as ASQC (American Society for Quality Control), APICs (American Production Inventory Control Society), and IEE (Industrial Environmental Engineering). Students are introduced to industry concerns and real problems. Second, in a capstone course for the Quality Technology degree, the students are required to write a Quality Manual for an actual company. The manual must be based on the ISO 9000 and 9001 standards. Their knowledge of quality issues is validated by the manual and they take it with them as part of their portfolio when they graduate.

Specific courses have not adopted quality education initiatives more than others, but rather the initiatives have been adopted into specific Quality courses.

Students generally do not get involved in the process of course development. The criteria for certification of courses and curriculum developed by the ASQC is relied on as well as the institution's committee review process.

FEEDBACK METHODS

Feedback is obtained from the students using the following methods. After the students return from their internships with industry, an active attempt is made to receive input about their experience. The students are required to give a presentation to other student groups about their work, what the company expected, and what they

needed to be able to do. These presentations are an important method of reinforcing the faculty message of what is important for the students to understand. Active contact is maintained with graduates, of whom there are about 18-20 per year.

Undergraduates give end-of-course feedback. Specific areas in which student feedback is solicited include the specific instructor and the specific course.

The entire curriculum is reviewed by graduating seniors.

Student feedback is seen by the individual instructor and the department head.

It is very seldom that student comments or direction results in change to the curriculum or courses. The areas most likely to be affected by feedback are classroom delivery, class schedule, and testing. The end-of-course surveys ask standard questions such as "Did the instructor make appropriate use of the time?"

The student does not have the opportunity to see the result or effects of the feedback. The student has usually gone on to the next class, or in the case of graduate surveys (done 6 months after graduation), gone from the university. The problem with the graduate surveys is that it is too long after graduation. The graduates forget what was really irritating them after 6 months.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study; however, in the Quality Technology program the writing of the Quality Manual is a very thorough evaluation of the student's ability to comprehend and apply Quality principles.

Feedback is frequently solicited from the prospective employers of the graduates through the Industrial Advisory Board, student internships, and cooperative projects conducted by students based on industry problems.

The employer feedback is seen by the person who asks for it. In this case, by Dr. Carlson.

The employer feedback is used to judge the pace of change to the curriculum or courses compared to industry's interests.

There haven't been any dramatic changes in employer satisfaction with the university or with the students, primarily because a <u>commitment to Industry</u> has always been a cornerstone to the university's principles. Industry does

seem to be happy with the school's graduates, as evidenced by the 98% placement statistic. But this has been going on for the last 20 years! Quality is the latest step in responding to industry's concerns for UW-Stout.

GENERAL ISSUES

According to Dr. Carlson, the greatest success with his efforts to enable students to comprehend and apply quality principles is the capstone course where the students are required to write a Quality Manual. The project works effectively to integrate their learning about comprehending Quality and applying it to industry.

Dr. Carlson reports no disappointments in his efforts to enable students to comprehend and apply quality principles.

Dr. Carlson reports that the major roadblock he has encountered is that the students possess inadequate skills to meet the demands of the course and industry. Specifically, they are not able to successfully apply quantitative techniques and communicate them appropriately. They can't write technical reports. Therefore, extra time must be spent on what he considers remedial education. Also, he wishes that faculty would pay more attention to their position as professional, or disciplinary, role models and emulate the behavior that they know employers will desire in their employees for the benefit of their students.

Dr. Carlson has not found any processes that were ineffective or impractical.

Further improvements that Dr. Carlson would like to make to enable students to comprehend and apply quality principles in their fields of study include improving the level of agreement within industry and society in general about exactly what standard it is they really want to adopt. That way, the educational institutions can do a better job preparing their students if the standards are consistent.

TELEPHONE SURVEY SUMMARY

NAME: Bob Sedlak

SCHOOL: University of Wisconsin-Stout

POSITION: Associate Vice Chancellor (Academics)

PHONE: (715) 232-1682

DATE: 22 June 1993 TIME: 1400 (EST)

INTERVIEWER: Shimel

GENERAL CURRICULUM DEVELOPMENT

Formal classes specifically dealing with quality improvement concepts is offered and another has just been developed. The Systems in Service Industry course is cross-listed with both the Industrial Management department and the Business Department. It is a mandatory/core course for a concentration in Quality Technology for the Bachelor Science Degree in Industrial Technology and it is a selective course for the General and Retail Business degrees. It does not focus on a particular advocate or approach, but does introduce several, letting the students evaluate the different merits.

The institution does have formal guidance for curriculum construction and content. This guidance does not contain specific considerations for teaching students how to comprehend or apply total quality principles. It specifies the expected content of the course, to include objectives, an outline, evaluation procedures, a reference list, the needed resources, and any prerequisites.

Changes have not been made to the general curriculum structure at the university level to teach students how to apply total quality principles.

Some specific departments have adopted quality education initiatives more than others. The initiatives have primarily come from individually concerned faculty in the Business, Retail, Hospitality, and Tourism courses. The changes have been made "bottom's up." Mr. Sedlak is uncertain how many faculty actually buy into the changes and therefore, thinks that the changes are primarily the result of a few interested faculty. There has not been any wholesale culture change in any department. He is not aware of any conscious cause-effect results from adopting the TQM initiatives.

The institution does offer cross-discipline or multi-discipline courses, such as the Quality Systems in Services Industry. A course in Industrial Management is cross-listed with the Industrial Technology Department and School of Home Economics.

The institution does not have guidelines to teach across disciplines or offer multi-disciplinary courses. Courses designed to be cross or multi-discipline are negotiated between the dean, involved departments, and the faculty. The Vice Chancellor for academics also has a policy of not penalizing departments during the process of credit hours generation for contributing to a course which is listed with another department.

Students participate in general curriculum or program development through student membership on degree program advisory committees and on the University-wide curriculum committee, one for undergraduates and one for graduate programs. The student representatives are selected by the Graduate Student Association and the Student Association, respectively.

Guidelines for regulating student workload are that students must obtain permission from the Dean of Students to take more than 20 credit hours.

COURSE DEVELOPMENT AND DELIVERY

No formal changes have been made to particular courses to teach students how to comprehend or apply quality principles. Some informal changes have been made by individual faculty.

The institution employs the following methods to help students to comprehend and apply total quality principles.

They often invite outside employers (business leaders, CEOs) to talk to the students.

Team teaching is not used as much as it could be, in Mr. Sedlak's opinion.

Instructors from other disciplines or departments are invited to teach, usually on a one-time basis for a specific lesson, as needed.

Group discussion techniques are used extensively.

Mr. Sedlak is not aware of the use of lesson plans developed by prospective employers.

Student team exercises are also used heavily to emphasize cooperative learning.

Real life scenarios are an important part of many courses.

Benchmarking, as in the documentation of standards, in the Quality Systems in Services Industry class, and

statistical process control in the core curriculum of Industrial Technology are other quality improvement methods used.

Mr. Sedlak does not know if specific courses have adopted quality education initiatives more than others.

Students do not participate as much in course development as they do in curriculum development. Their role is related to advisory committee work with the curriculum, which acts as a catalyst for new courses.

FEEDBACK METHODS

Feedback from the students is obtained from the students using the following methods: End-of-course Instructor/Course evaluations, follow-up studies with graduates and their employers one and three years after graduation, and through ad-hoc student surveys about various subjects of administration, faculty, or student interest. Some example subjects include campus diversity, the role of student advising, and the comfort level of students (minorities specifically) on campus.

Specific areas in which student feedback is solicited include the specific instructor, the specific course, the entire curriculum (through a program review or student survey of students currently enrolled in a program), and the university educational environment (on an ad hoc basis); as well as special requirements such as the diversity requirement imposed in 1990.

Student feedback is seen by the instructor of the course for which the evaluation is completed, the department chair, and the curriculum committee chair. The evaluations are used for merit reviews or tenure decisions, for example. Poor reviews of a professor can cause a peer review and/or dismissal.

Student feedback can result in change to the curriculum or courses through the following process: Two years ago a series of student surveys were initiated to discover if any course duplication existed. The students claimed there was. After some coaching of the students to be more specific, some areas were checked and confirmed by the faculty. Negotiations between faculty and departments redefined each affected course's scope and depth and continue to do so in response to new student suggestions. The effort to avoid course duplication is the intensive use of student feedback. In other areas, the instructor has much more flexibility in deciding to adopt student suggestions.

The student normally does not have the opportunity to see the result or effects of the feedback in action. The result comes too late to see change. However, when sending surveys to the students, the cover letter often identifies past suggestions and publicizes the changes that resulted. One example is the addition of a remedial Algebra Course to help improve the passing rate in Introductory Algebra. It was discovered that the classes consisted of two groups. One group had little trouble and the other had a lot of trouble. By introducing the intermediate course for those weak in math skills, the resulting passage rate for the Intro course increased from 60% to 85%.

The institution does not have specific methods to measure how well the students are comprehending and applying quality principles within their fields of study. Typically, if quality is introduced in a course, it is evaluated traditionally, along with the other course material.

Feedback is solicited from the actual employers of the graduates by including them in the 1 and 3 year surveys of the graduates. Questions are asked about their satisfaction with the graduates, overall, and with respect to their graduates' skills in oral and written communication and in problem solving.

Also, feedback is received from the business community members of the curriculum advisory committee.

The employer feedback is seen by the Dean, the Vice-Chancellor, the Chancellor, and the advisory committee of the degree program affected by the suggestions.

The employer feedback results in change to the curriculum or courses as part of the information seen by the Advisory Committee. Departments can have Business/Industry Committees. For example, there is an Electronics Advisory Committee. The faculty also can solicit help from the employers by offering to work on industry problems as part of a project for a course.

There has not been any significant changes noted in employer satisfaction with the university or with the students. Historically, UW-Stout has had a very strong relationship with its employers and a very strong placement record. Their involvement with Total Quality Management is another example of their commitment to the interests of those employers.

GENERAL ISSUES

According to Mr. Sedlak, he did not feel qualified to answer the remaining questions about the actual successes, failures, roadblocks, or disappointments with implementing TQM.

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13. ABSTRACT *(Maximum 200 words)*

This research investigated some of the educational processes which are being used by several universities to enable their students to comprehend and apply Total Quality principles. The results of this research are intended to be used by Department of Defense institutions of higher education as a guide to help them adopt practices which will enable their students to comprehend and apply Total Quality in their future assignments.

Using a source list of schools from Quality Progress (Oct 1992), points of contact were interviewed at several civilian and military universities across the United States. Investigative questions were developed and asked concerning the specific educational processes of curriculum development, course construction and delivery, and the use of employer and student feedback. The results of the interviews were consolidated, compared, and contrasted to produce a guide of activities that have been attempted by universities trying to impart the principles of Total Quality to their students. The self-reported impressions of strengths and weaknesses were also reported.

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