

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

- **Mission Statement**

Institutional Mission. The mission of the United States Military Academy is:

“To educate, train, and inspire the Corps of Cadets so that each graduate is a commissioned leader of character committed to the values of Duty, Honor, Country and prepared for a career of professional excellence and service to the Nation as an officer in the United States Army.”

The mission is published in the *USMA Redbook* (Academic Program Curriculum and Course Descriptions, <http://www.dean.usma.edu/sebpublic/curricat/static/index.htm>), in the *West Point Catalog*, and in *Educating Future Army Officers for a Changing World* (<http://www.dean.usma.edu/support/aad/EFAOCW.pdf>).

The purpose of the Military Academy’s Academic Program is to establish the intellectual foundation for service as a highly-educated commissioned officer, and to develop in cadets the knowledge and skills necessary for service and continued growth as an officer in the United States Army. The overarching goal of the Intellectual Domain* at the United States Military Academy is “to enable its graduates, as leaders of character, to anticipate and to respond effectively to the uncertainties of a changing technological, social, political, and economic world.” From this goal, the Military Academy derives a set of ten specific Intellectual Domain goals that address specific Army needs and reflect the attributes that the Military Academy seeks to develop in every graduate. The following ten Intellectual Domain goals are published in *Educating Future Army Officers for a Changing World*.

1. **Mathematics & Science.** Graduates are scientifically literate and are capable of applying scientific, mathematical, and computational modes of thought to the solution of complex problems.
2. **Engineering & Technology.** Graduates apply mathematics, science, technology, and the engineering design process to devise technological problem solutions that are effective and adaptable.
3. **Information Technology.** Graduates understand and apply Information Technology concepts to acquire, manage, communicate and defend information, solve problems, and adapt to technological change.
4. **Cultural Perspective.** Graduates draw from an appreciation of culture to understand in a global context human behavior, achievement, and ideas.
5. **Historical Perspective.** Graduates draw on an appreciation of history to understand in a global context human behavior, achievement, and ideas.
6. **Understanding Human Behavior.** Graduates understand patterns of human behavior, particularly how individuals, organizations, and societies pursue social, political and economic goals.
7. **Communication.** Graduates listen, read, speak, and write effectively.
8. **Creativity.** Graduates think and act creatively.

* The Cadet Leader Development System identifies six domains in which student development occurs. They are the Intellectual, Military, Physical, Moral-Ethical, Social, and Human Spirit Domains.

9. **Moral Awareness.** Graduates recognize moral issues and apply ethical considerations in decision-making.

10. **Continued Intellectual Development.** Graduates demonstrate the capability and desire to pursue progressive and continued intellectual development.

To attain these goals, the Military Academy's curriculum has two principal structural features, described in *Educating Future Army Officers for a Changing World*. "The first is a broad set of core courses, which provide an intellectual foundation for service as a commissioned officer. These core courses, along with Military Science and Physical Education classes, constitute the Military Academy's "professional major." The second is a set of concentrated elective courses in a major, which provide cadets with the opportunity to specialize in a discipline of their choice. Upon completing the requirements of these programs, all cadets receive a Bachelor of Science degree."

Department Mission and Vision. Department of Civil and Mechanical Engineering faculty agreed upon the current mission at the faculty retreat in August 2005. The mission of the Department of Civil and Mechanical Engineering is:

"To educate cadets in civil and mechanical engineering, such that each graduate is a commissioned leader of character who can understand, implement, and manage technology; and to inspire cadets to a career in the United States Army and a lifetime of personal growth and service."

The mission is posted prominently in the department conference room and is published on the department web site,

<http://www.dean.usma.edu/departments/cme/CME%20Home/mission.htm>.

The faculty established the vision of the Department of Civil and Mechanical Engineering concurrently with the latest mission statement. The vision for the department is:

- o A model learning community of cadets, staff, and faculty that:
 - Places teaching and learning at the heart of all we do.
 - Attracts a diverse group of high-quality people and develops them to their full potential.
 - Embraces change through systematic assessment and improvement of our curricula, programs, and facilities.
 - Engages in scholarship that fosters the intellectual development of cadets, staff, and faculty.
 - Serves and shares knowledge with the Army, the engineering profession, and the academic community.
 - Maintains a climate of mutual respect and camaraderie.
- o The national leader in undergraduate civil and mechanical engineering education.

- **Program Educational Objectives**

The Mechanical Engineering program has seven Program Educational Objectives:

Graduates who major in mechanical engineering:

1. Demonstrate the philosophical basis for the practice of engineering that applies creative design and engineering thought processes to solve problems.
2. Continue to develop an understanding of and appreciation for natural laws and technology, particularly as they apply to mechanical engineering.
3. Act responsibly upholding strict ethical and moral standards and considering impacts of decisions on social, political, economic, and technological issues.
4. Demonstrate necessary leadership and teamwork skills to work in multidisciplinary team environments.
5. Demonstrate elements of engineering practice that prepare graduates for advanced study in engineering or other technical areas to include admission into and success at top engineering graduate programs.
6. Communicate orally and in writing using correct and precise terms, demonstrating clear, critical thinking.
7. Commit to continuous self-improvement and life-long learning with the flexibility to adapt to changing Army needs.

These objectives are published in the *Mechanical Engineering Major* pamphlet; in the *USMA Redbook*, <http://www.dean.usma.edu/sebpublic/curricat/static/index.htm>); and at <http://www.dean.usma.edu/departments/cme/CME%20Home/mission.htm>, the department web site.

- **Consistency of the Program Educational Objectives with the Mission of the Institution**

The Mechanical Engineering Program supports the United States Military Academy's General Educational Goal by providing high-quality instruction and study in the discipline of Mechanical Engineering. The Mechanical Engineering program stresses engineering fundamentals so that graduates are well equipped to understand complex technical problems in a rapidly changing high-technology Army. Much of the Army's combat power and logistics capability lies in mechanical systems such as individual and crew-served weapons, wheeled and tracked vehicles, aircraft, missiles, munitions, engines, power production equipment, and ballistic protection. These systems are constantly increasing in complexity and technological sophistication. The Army needs leaders who are fully cognizant of the capabilities and limitations of these systems. Officers with expertise in mechanical engineering fulfill this need because they understand the fundamental principles on which the

design of mechanical systems is based. Army mechanical engineers ideally are qualified to lead the research, development, and acquisition of these systems later in their careers.

Table 2-1 demonstrates the consistency between the Mechanical Engineering Program Educational Objectives and the Academy’s Intellectual Domain Goals that support the institution’s mission.

Table 2-1. Consistency Between Mechanical Engineering Program Educational Objectives and Institution Intellectual Domain Goals

		Mechanical Engineering Program Educational Objectives							
		1. Demonstrate the philosophical basis for the practice of engineering that applies creative design and engineering thought processes to solve	2. Continue to develop an understanding of and appreciation for natural laws and technology, particularly as they apply to mechanical engineering	3. Act responsibly upholding strict ethical and moral standards and considering impacts of decisions on social, political, economic, and technological issues.	4. Demonstrate necessary leadership and teamwork skills to work in multidisciplinary team environments.	5. Demonstrate elements of engineering practice that prepare graduates for advanced study in engineering or other technical areas to include admission into and success at top engineering graduate programs.	6. Communicate orally and in writing using correct and precise terms, demonstrating clear, critical thinking.	7. Commit to continuous self-improvement and life-long learning with the flexibility to adapt to	
		3 = Strong Support							
		2 = Moderate Support							
		1 = Weak Support							
Intellectual Domain Goals	1. Mathematics & Science	3	3	1	1	3	1	1	
	2. Engineering & Technology	3	3	1	1	3	1	1	
	3. Information Technology	3	3	1	1	3	1	1	
	4. Cultural Perspective	1	1	3	2	1	1	1	
	5. Historical Perspective	1	1	3	1	1	1	1	
	6. Understanding Human Behavior	1	1	3	3	1	1	2	
	7. Communication	1	1	1	3	2	3	1	
	8. Creativity	3	1	1	2	2	1	2	
	9. Moral Awareness	1	1	3	2	1	1	1	
	10. Continued Intellectual Development	2	2	1	1	3	2	3	

The Mechanical Engineering Program Educational Objectives are consistent with the mission of the Military Academy, the overarching goal of the Intellectual Domain and the ten Intellectual Domain Goals, and the mission of the Department of Civil and Mechanical Engineering. Taken together, the Mechanical Engineering Program Educational Objectives support the General Education Goal and the mission of the United States Military Academy.

- Program Constituencies**

The U.S. Army. Given that all cadets become commissioned officers upon graduation, the Army is the Mechanical Engineering Program’s principal constituency. The principal source of information that connects the Army’s needs to the USMA Academic Program is the strategic vision document, *Educating Future Army Leaders for a Changing World*. This document articulates the Military Academy’s Intellectual Domain Goals and their associated learning models and demonstrates how the goals satisfy the Army’s needs for well-educated officers. Thus, by ensuring that the Program Objectives are consistent with the Military

Academy's Intellectual Domain Goals, the Mechanical Engineering program is connected to the needs of the Army. The program's relevance to Army needs also is assured by always having at least one senior Army leader as a representative to the Mechanical Engineering Advisory Board.

The Mechanical Engineering Profession.

Given that Military Academy graduates do not directly enter technical engineering positions in industry, the Mechanical Engineering program turns to the norms of the Mechanical Engineering profession to ensure that the program is reasonably comparable with Mechanical Engineering programs at civilian institutions. The principal sources for information about the norms of the Mechanical Engineering profession are ABET Engineering Accreditation Commission (EAC) Program Criteria and guidance from the American Society of Mechanical Engineers (ASME).

These major constituencies are represented by the following groups:

- o *Current Mechanical Engineering Program Students (Cadets).*
Currently enrolled Mechanical Engineering majors provide valuable input about the structure, content, and implementation of the program, about the appropriateness of the Program Educational Objectives and Program Outcomes, and about their own perceived proficiency with respect to Program Outcomes. This input is obtained through (a) a web-based course feedback system that includes program-specific and course-specific questions, (b) a Mechanical Engineering Program Exit Survey administered to all senior Mechanical Engineering majors approximately one month prior to graduation, and (c) the United States Military Academy First Class Survey completed by all senior cadets.
- o *Mechanical Engineering Advisory Board.*
The Mechanical Engineering Advisory Board is composed of a diverse mix of professionals from industry, professional societies, academia, and the U.S. Army. Membership includes individuals who serve long-term to maintain a stable core component and annually solicited new individuals who provide fresh perspective. These individuals represent both a cross-section of the Army and the Mechanical Engineering profession and provide feedback on the needs of both. Members see and supervise graduates from the program and are able to comment and provide feedback for the program.

The Advisory Board's input is valuable because most of its members are external to the Military Academy, yet they have some degree of familiarity with the program. Members include active duty Army officers, engineering practitioners, university faculty members, laboratory researchers, and others; thus the Board represents a wide diversity of perspectives on the content and quality of our program. Input from the Mechanical Engineering Advisory Board members is obtained through an Annual Advisory Board Meeting. The meeting is normally conducted on a Friday/Saturday in the fall in conjunction with the Academy's Engineering Exposition to afford maximum interaction with students. Current members of the Board and their positions are shown in Table 2-2.

Table 2-2. Mechanical Engineering Program Advisory Board Members

Name	Position
Dr. Lanny Griffin	Professor of Biomedical Engineering, California State Polytechnic University, San Luis Obispo, California
Mr. Andrew Keith	Deputy Chairman, Sikorsky Aircraft Corporation, New Haven, Connecticut
General (Retired) Paul Kern	USMA Class of 1950 Chair of Advanced Technology and Senior Counselor, The Cohen Group, Washington, D.C.; former Commanding General, Army Materiel Command (2001-2004)
Colonel Kevin Moore	Commander, Watervliet Arsenal, Watervliet, New York
Colonel Michele Putko, Ph.D., P.E.	G-4, 32 nd Army Air and Missile Defense Command, Fort Bliss, Texas
Ms. Susan Skemp	Past President, American Society of Mechanical Engineers and Executive Director for the Center of Excellence in Ocean Energy Technology, Florida Atlantic University, Dania Beach, Florida
Dr. Jeffrey Swab	Ceramic Research Engineer, Army Research Laboratory, Aberdeen Proving Ground, Maryland
Colonel Robert A. Swenson	Commander, Letterkenny Army Depot, Chambersburg, Pennsylvania
Dr. Edward G. Tezak	State University of New York Distinguished Service Professor, Department of Mechanical Engineering Technology, Alfred State College, Alfred, New York

- o *Graduates of the Mechanical Engineering Program.*
Mechanical Engineering program graduates provide input about the appropriateness of the Program Objectives, about their own achievement of these objectives, about the quality of their educational experience at the Military Academy, and about the kinds of technical work they have been doing since graduation. This input is obtained through (1) the USMA Graduates Survey administered every year; (2) the USMA Commanders Survey administered every year; and (3) a discipline specific Survey of ABET Accredited Program Graduates, conducted every three years.
- o *Commanders and Supervisors of Graduates of the Mechanical Engineering Program.*
Each year the commanders and supervisors of graduates with three years of experience are surveyed concerning the performance of the individual graduates they supervise. This survey gives valuable feedback to the program on the ability of the programs to meet the general needs of the Army in the short term. Data allows the program to compare the performance of program graduates against the performance of all Military Academy graduates.
- o *Returning USMA Rotating Mid-Grade Military Faculty.*
The Academy's unique faculty structure provides a resource for keeping programs connected with the needs of the Army and the norms of their profession. The majority of faculty members are active duty Army captains and majors who have recently

commanded Army troop units. Annually, the program selects up to six Army officers to attend advanced graduate schooling in Mechanical Engineering. A percentage of these officers are Academy graduates. Upon completing graduate school, these officers serve as faculty members for a two (on an exception basis) or three-year rotating military tour. Because of their familiarity with the Mechanical Engineering program and the requirements for advanced schooling in Mechanical Engineering, along with their recent experience in the Army and working with Academy graduates, these officers provide excellent feedback on the accomplishment of the Mechanical Engineering program educational objectives. Each year the Mechanical Engineering Program Director conducts a focus group session and administers a feedback survey with this group.

o *Capstone Design and Advanced Individual Academic Development (AIAD) Sponsors.*

Army agencies and laboratories sponsor a number of Capstone Design projects and Advanced Individual Academic Development summer opportunities (similar to cooperative programs at other universities). Because of their connection to cadets and graduates and their knowledge of Army needs, these sponsors provide excellent informal feedback for the Mechanical Engineering program.

o *Graduate School Advisors*

One of the objectives of the Mechanical Engineering Program is to sufficiently prepare graduates for advanced schooling in the future. This also relates to the objective of instilling a commitment to progressive and continued educational development. One measure of the Mechanical Engineering Program's success in meeting these objectives is the success of graduates sent back for Master's degrees prior to returning to the department as an instructor. Graduate School Advisors see these graduates and are able to compare their performance to graduates of other institutions. These individuals also represent the mechanical engineering profession.

• **Process for Establishing Program Educational Objectives**

Drawing upon the mission and the goals of the institution and the needs of the constituencies cited above, the Mechanical Engineering Program Educational Objectives were established. A Quality Function Deployment (QFD) format was used in accomplishing this task. First the needs of the constituencies were assembled. Based on these requirements, program educational objectives were formulated that met these needs. As prescribed by Quality Function Deployment principles, these objectives were formulated in a manner that was measurable to be able to determine their accomplishment. In a feedback cycle, these program objectives have been communicated to our various constituencies for their review over time and have evolved into their current form. The methods for this review and updating have primarily been focus groups and surveys with the appropriate constituencies identified above.

To provide evidence and documentation of the process that involves our constituencies in establishing and reviewing the Mechanical Engineering Program Objectives, two previous versions of the objectives are offered. These versions show how the Program Objectives have evolved over time into their current form based on the feedback received.

Mechanical Engineering Program Educational Objectives-May 1996 (ABET visit).

- o Design and teach courses in the Mechanical Engineering curriculum that develop a thorough and deep understanding of basic physical laws of nature relevant to the field of Mechanical Engineering.
- o Design and teach courses in the Mechanical Engineering curriculum that develop an ability to logically analyze, synthesize, and evaluate a physical problem.
- o Design and teach courses in the Mechanical Engineering curriculum that internalize an engineering design process and foster creativity in solving problems.
- o Design and teach courses in the Mechanical Engineering curriculum that provide graduates with basic technical competence in Mechanical Engineering so that they can function as entry-level engineers or successfully enter advanced technical schooling.

With the implementation of Engineering Criteria 2000, it was realized that these objectives were based entirely on the internal determination of our faculty. At that point, the Quality Function Deployment procedure described above was applied and inputs from our constituencies were included to develop the following updated objectives in 1998.

Mechanical Engineering Program Educational Objectives-Fall 1998

- o Inculcate the philosophical basis for the practice of engineering as a social enterprise that uses design to solve problems.
- o Develop an understanding of, and appreciation for, the natural physical laws, particularly as they apply to mechanical engineering.
- o Internalize the design process and foster creativity in solving problems
- o Provide those elements of engineering practice necessary for success as an entry-level mechanical engineer or for admission into and success at a top mechanical engineering graduate program.
- o Instill in the graduate a commitment to life-long learning.
- o Maintain sufficient infrastructure and personnel to support scholarly activity.

These objectives evolved into their 2002 form based on input and feedback from our constituents. The 2002 version added the “engineering thought process” in the first objective since it was in direct support of the goals of the institution. An additional objective was added to address communication skills in support of the Academy Program goals and to directly address the ABET EC2000 outcomes. It was determined that the last objective was

not easily measurable and fit more appropriately in Criterion 6 of EC2000. As a result, it was dropped.

Mechanical Engineering Program Educational Objectives- May 2002 (ABET visit)

- o Demonstrate the philosophical basis for the practice of engineering that applies an engineering thought process and uses design to solve problems of the Army and the nation.
- o Continue to develop an understanding of, and appreciation for, the natural physical laws and technology, particularly as they apply to mechanical engineering.
- o Internalize the design process and foster creativity in problem solving.
- o Demonstrate the necessary leadership and teamwork skills to work in multidisciplinary team environments.
- o Demonstrate those elements of engineering practice that prepare graduates for advanced study in mechanical engineering or other technical areas to include possible admission into and success at top mechanical engineering graduate programs.
- o Communicate, orally and in writing, correctly and in precise terms, with each communication evincing clear, critical thinking.
- o Are committed to continuous improvement and life-long learning with the flexibility to adapt to changing Army needs.

These objectives evolved into their current form based on input and feedback from our constituents during a 2005 Advisory Board meeting. The board addressed a void in the program's global perspective. Objectives 1 and 3 were redundant and were combined and minor grammar corrections were suggested and adopted.

Mechanical Engineering Program Educational Objectives- Current Version

- o Demonstrate the philosophical basis for the practice of engineering that applies creative design and engineering thought processes to solve problems.
- o Continue to develop an understanding of and appreciation for natural laws and technology, particularly as they apply to mechanical engineering.
- o Act responsibly upholding strict ethical and moral standards and considering impacts of decisions on social, political, economic, and technological issues.
- o Demonstrate necessary leadership and teamwork skills to work in multidisciplinary team environments.

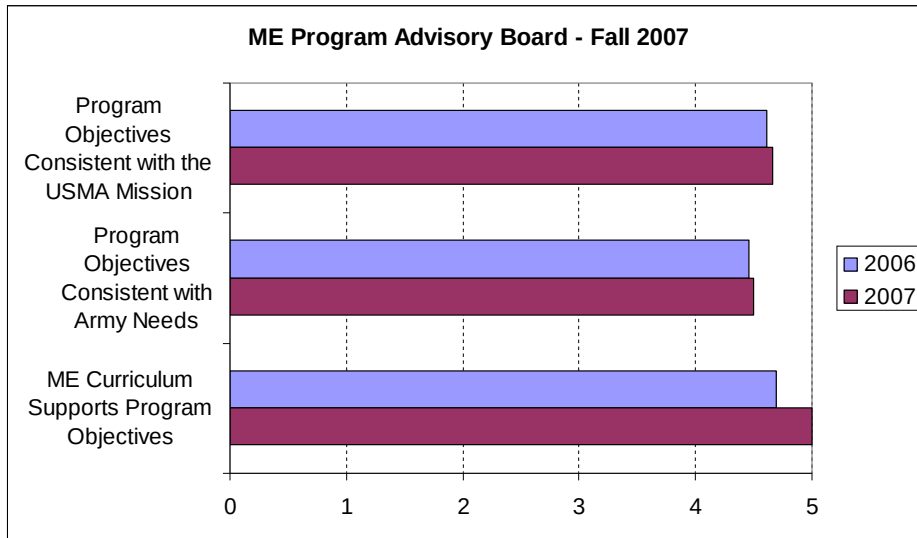
- o Demonstrate elements of engineering practice that prepare graduates for advanced study in engineering or other technical areas to include admission into and success at top engineering graduate programs.
 - o Communicate orally and in writing using correct and precise terms, demonstrating clear, critical thinking.
 - o Commit to continuous self-improvement and life-long learning with the flexibility to adapt to changing Army needs.
- **Appropriateness of Program Educational Objectives**

The current Mechanical Engineering Program Educational Objectives reflect the needs of the Army and the Mechanical Engineering profession and are consistent with the Military Academy's mission. These objectives also reflect the "baseline" needs of the profession through consistency with EAC criteria. Constituents (through the Advisory Board) have reviewed and validated these Program Educational Objectives.

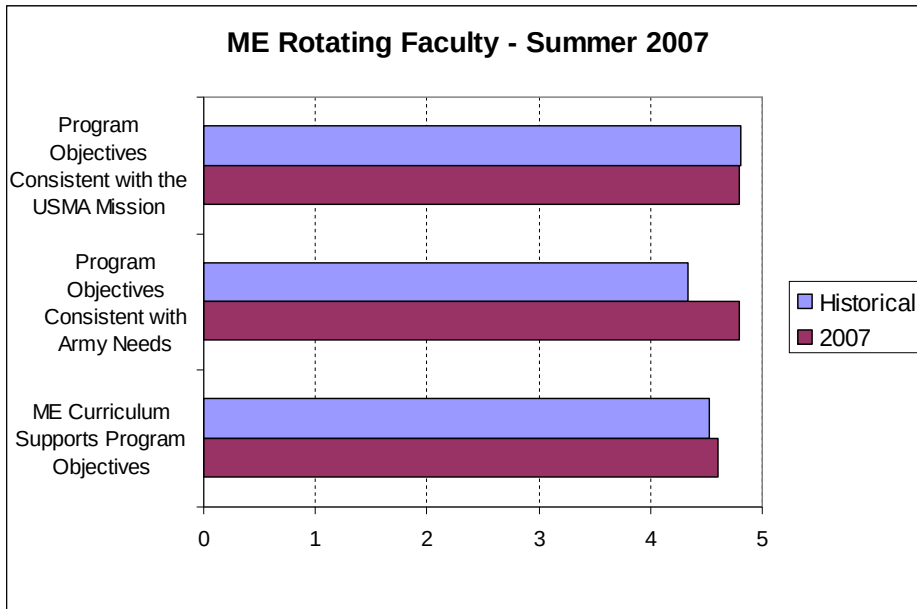
These Mechanical Engineering Program Educational Objectives continue to be reviewed and updated based on input from our constituents. Since program educational objectives describe the career and professional accomplishments that the program is preparing graduates to achieve, two of the appropriate constituencies for providing feedback on the objectives' appropriateness are the Mechanical Engineering Advisory Board and the Returning USMA Rotating Junior Military Faculty Focus Group. Annually input is solicited from both of these groups on the appropriateness of the objectives. They are specifically asked:

- o Are the mechanical engineering program objectives consistent with the mission of the United States Military Academy?
- o Are the mechanical engineering program objectives consistent with the needs of the Army?
- o Does the current ME curriculum support the achievement of these objectives?
- o Provide any further narrative input on these topics.

Figure 2-1 presents the most recent results from this feedback cycle:



(a) Program Advisory Board



(b) Rotating Faculty

Scale:
5-strongly agree 4-agree 3-neutral 2-disagree 1-strongly disagree

Figure 2-1. Appropriateness of Program Educational Objectives

As evidenced by the responses, there is strong agreement that the Mechanical Engineering Program Objectives are consistent with the Military Academy’s mission and with Army needs. A composite score above 4.0 is the desired benchmark metric. Data are collected annually. Detailed long-term results are in the Annual Mechanical Engineering Program Assessment Notebooks that will be available for review by the Program Evaluator.

Although it collects assessment data annually, the Mechanical Engineering program formally evaluates appropriateness of its Program Educational Objectives and how well the program is meeting its Program Educational Objectives every three years. Figure 2-2 shows the two-loop process that consists of slow and fast feedback loops. Review of objectives is on the slow loop and occurs less often than the annual program outcomes assessment and evaluation.

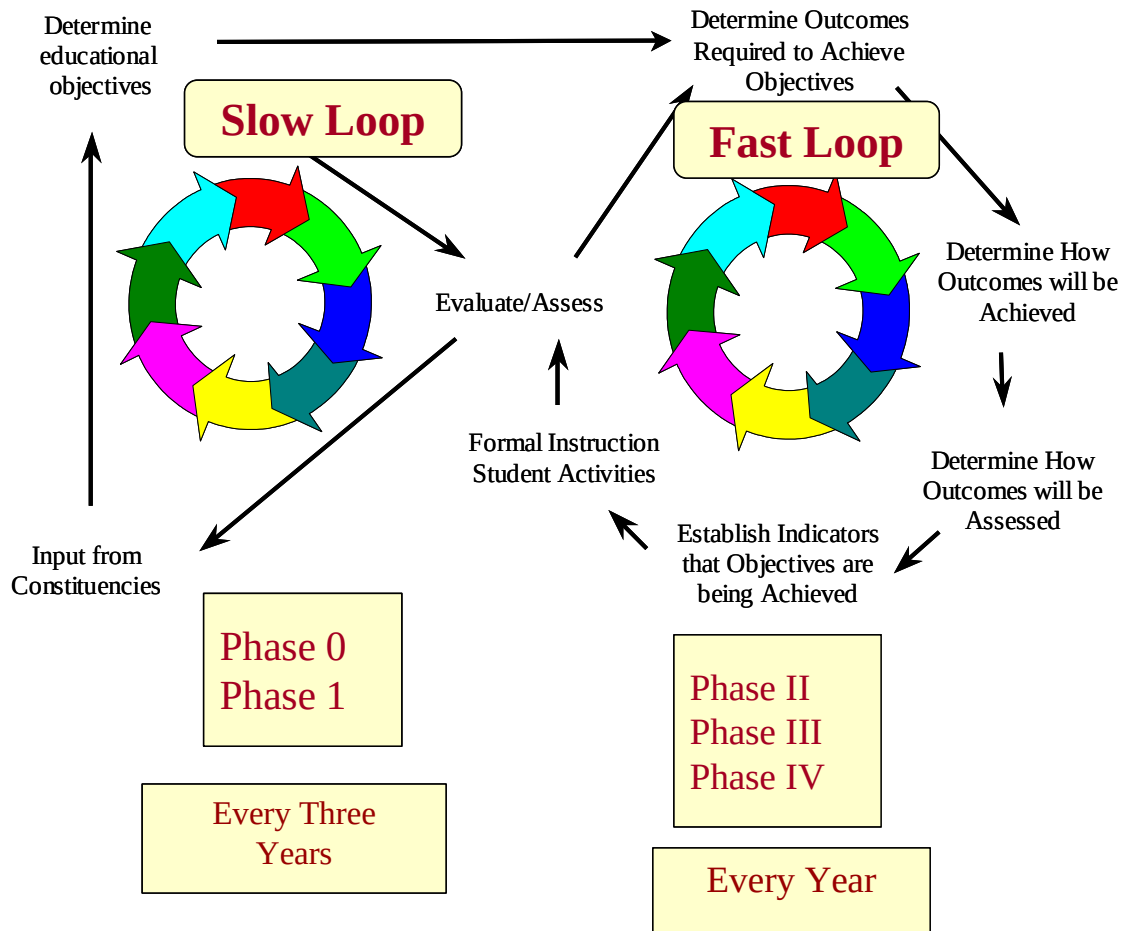


Figure 2-2. Two-Loop Assessment and Evaluation Process

- **Achievement of Program Educational Objectives**

This section describes the processes in place to ensure achievement of the Mechanical Engineering Program Educational Objectives. Data are provided that show assessment and evaluation processes are working and producing the desired results. The Mechanical Engineering program uses these results to improve effectiveness of the program.

The Mechanical Engineering Program assessment methodology supports the Academy's model as outlined in the Fig. 2-3 and explained in the Academy's publication, *Educating Future Army*

Officers for a Changing World. The methodology also supports thorough assessment of the program in support of ABET Inc.'s EAC criteria.

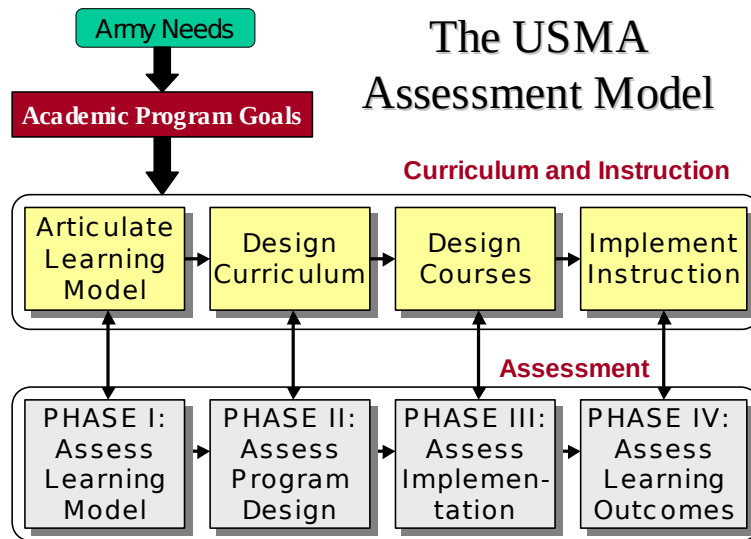


Figure 2-3. USMA Assessment Model

The Mechanical Engineering program documents its annual Program Assessment by developing and maintaining a Program Assessment Book for each academic year. The Program Assessment Book is a tabbed three-ring binder. The book includes assessment data, evaluation results, and supporting data. Program Assessment books for the past six academic years will be available for the Program Evaluator.

Assessment Processes

Assessment includes identification, collection, and preparation of data to prepare to evaluate the achievement of program objectives. Several forms of data are included in the assessment processes.

o USMA ABET Graduates Triennial Survey

Identification: A survey is administered to graduates of the Mechanical Engineering program to obtain feedback on the effectiveness of the specific ABET academic program. Graduates from each ABET-accredited program are administered a discipline specific survey. Prior to administration of the survey, the Program Director is given the opportunity to review and approve the questions that are included in the survey.

Collection: Every three years, the Academic Affairs Division of the Office of the Dean through the USMA Office of Policy, Planning, and Analysis' Institutional Research and Analysis Branch conducts a survey targeting graduates of the Academy's ABET-accredited programs. For the survey administered in late 2006, the Division targeted graduates in the classes of 1999 through 2002. Completed surveys were sent directly to the Academic Affairs Division to be compiled.

Preparation: The Academic Affairs Division collects the survey data and provides it to the Mechanical Engineering Program Director. The Program Director selects those questions that provide the strongest measure of program objective achievement and computes the average rating or percentage for the set of data.

o USMA Graduates/Commanders Survey

Identification: A survey is administered to all USMA graduates and their commanders/supervisors to obtain feedback on their performance as Army officers. Survey responses of Mechanical Engineering majors can be identified; thus performance of Mechanical Engineering majors can be compared with the performance of all other graduates and with longitudinal performance of Mechanical Engineering majors. This survey asks graduates and their commanders/supervisors about their perception of the quality of education they received in their engineering major as well as the Academy as a whole.

Collection: Every year, the Academic Affairs Division of the Office of the Dean conducts a survey targeting individuals who have graduated four to eight years prior and their commanders/supervisors. For the survey administered in 2007, the Academic Affairs Division targeted graduates in the class of 2003. Completed surveys were sent directly to the Academic Affairs Division to be compiled.

Preparation: The Academic Affairs Division collects the survey data and provides it to the Mechanical Engineering Program Director. The Program Director selects those questions that provide the strongest measure of program objective achievement and computes the average rating or percentage for the set of data.

o ME Incoming Rotating Military Faculty Focus Group

Identification: A survey is administered to graduates of the Mechanical Engineering program who have obtained a Master of Science degree in a Mechanical Engineering discipline and have returned for a three-year assignment to the faculty. This survey asks graduates about the appropriateness of the program objectives and asks them to assess their level of achievement of each program objective.

Collection: Every year, the Mechanical Engineering Program Director surveys the newly arriving rotating faculty members as part of the faculty summer workshop. Completed surveys are collected by the program director.

Preparation: The Program Director computes the average for each set of responses.

o ME Graduate School Advisors Survey

Identification: A survey is administered to the Graduate School Advisors of graduates who are completing Master of Science or Ph.D. degrees and returning to teach in the

program. This survey asks graduate advisors to rate the level of achievement of each program objective for that graduate.

Collection: Every year, the Mechanical Engineering Program Director sends the survey to the advisors via e-mail. Completed surveys are collected by the Program Director.

Preparation: The Program Director computes the average for each set of responses.

o *ME Advisory Board Survey*

Identification: A survey is administered to the members of the Mechanical Engineering Program Advisory board. This survey asks board members to rate the appropriateness of the program objectives and asks them to assess the level of achievement of each program objective.

Collection: Every year, the Mechanical Engineering Program Director convenes the advisory board early in the fall semester; typically on the Friday preceding the annual Engineering Exposition. Completed surveys are collected by the Program Director.

Preparation: The Program Director computes the average for each set of responses.

Evaluation Processes

Evaluation is the process of interpreting data and evidence accumulated from assessment processes. The mechanical engineering program director reviews all data and evidence from assessment processes to determine the extent to which program objectives are being achieved. Results are presented to the mechanical engineering faculty and the advisory board.

During the visit the evaluation team will have access to the prepared materials described under Assessment Processes.

Overall Program Educational Objectives Evaluation

Table 2-3 presents a summary of the Mechanical Engineering Program Educational Objectives evaluation for Academic Year 2007. Minimum acceptable level of achievement is 3 out of 5 with 4 out of 5 the desired goal. Based on this most recent evaluation, the Mechanical Engineering program successfully has achieved its Program Educational Objectives.

Table 2-3. Summary of Mechanical Engineering Program Educational Objectives Evaluation

Mechanical Engineering Program Educational Objectives <i>Graduates who major in mechanical engineering:</i>	Program Director's Evaluation
1. Demonstrate the philosophical basis for the practice of engineering that applies creative design and engineering thought processes to solve problems.	4.0
2. Continue to develop an understanding of and appreciation for natural laws and technology, particularly as they apply to mechanical engineering.	4.0
3. Act responsibly upholding strict ethical and moral standards and considering impacts of decisions on social, political, economic, and technological issues.	4.5
4. Demonstrate necessary leadership and teamwork skills to work in multidisciplinary team environments.	4.0
5. Demonstrate elements of engineering practice that prepare graduates for advanced study in engineering or other technical areas to include admission into and success at top engineering graduate programs.	4.5
6. Communicate orally and in writing using correct and precise terms, demonstrating clear, critical thinking.	4.5
7. Commit to continuous self-improvement and life-long learning with the flexibility to adapt to changing Army needs.	4.5

5 – Excellent, 4 – Very Good, 3 – Acceptable, 2 – Weak, 1 - Poor

Details substantiating level of achievement of each program educational objective follow.

Level of Achievement of Program Educational Objective 1:

o Objective 1: Demonstrate the philosophical basis for the practice of engineering that applies creative design and engineering thought processes to solve problems.

o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Std.	Avg. Resp.
Tri	1	Develop your problem-solving abilities?	4/5	4.64
Tri	2	Establish a sound foundation in engineering design methodology?	4/5	4.41
Tri	33	When confronted with a complex mechanical engineering problem, I can devise a methodical approach to solve the problem.	4/5	4.48
Tri	34	When confronted with a complex mechanical engineering problem, I can devise a broad range of creative alternative solutions.	4/5	4.20
Tri	35	When confronted with a complex mechanical engineering problem, I can handle ambiguity and imperfect information in developing a solution.	4/5	4.28
Tri	36	When confronted with a complex mechanical engineering problem, I can select the best alternative solution based on well-reason.	4/5	4.43

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	8-4	Devise creative solutions to complex problems	4/5	4.43
Cdr	8-7	Solve basic real-world engineering problems	4/5	4.57

3. ME Incoming Rotating Military Faculty Focus Group: 4.4/5.0
4. ME Graduate School Advisor Surveys: 4.5/5.0
5. Mechanical Engineering Advisory Board Survey and Results (2006): 4.58/5.0

o **Evaluation – Objective 1 Level of Achievement: 4 (Very Good)**

Level of Achievement of Program Educational Objective 2:

o Objective 2: Continue to develop an understanding of and appreciation for natural laws and technology, particularly as they apply to mechanical engineering.

o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Std.	Avg. Resp.
Tri	31	To what extent was your engineering education at West Point effective in preparing you for the engineering or engineering-related tasks you have performed since leaving the Army?	4/5	4.39
Tri	37	When confronted with a complex mechanical engineering problem, I can choose appropriate tools (e.g. computer software, technical references, experimental data) to enhance the problem-solving process.	4/5	4.16
Tri	38	When confronted with a complex mechanical engineering problem, I can use the computer effectively as a problem-solving tool.	4/5	4.37

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	2-8	Use the Army's advanced technology	4/5	4.57

3. ME Incoming Rotating Military Faculty Focus Group: 3.6/5.0
4. ME Graduate School Advisor Surveys: 5.0/5.0
5. Mechanical Engineering Advisory Board Survey and Results (2006): 4.42/5.0

o **Evaluation – Objective 2 Level of Achievement: 4 (Very Good)**

Level of Achievement of Program Educational Objective 3:

o Objective 3: Act responsibly upholding strict ethical and moral standards and considering impacts of decisions on social, political, economic, and technological issues.

o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Std.	Avg. Resp.
Tri	32	When confronted with a complex mechanical engineering problem, I can recognize and define the problem in all of its dimensions – physical, technological, social, political, and economic.	4/5	4.35
Tri	41	When confronted with a complex mechanical engineering problem, I can act responsibly upholding strict ethical and moral standards while solving the problem.	4/5	4.72

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	6-5	Examine the moral implications of your actions	4/5	4.43
Cdr	6-6	Recognize moral issues in decision making	4/5	4.57
Cdr	6-13	Develop a moral-ethical environment in your unit	4/5	4.57

Notes:

Std. – indicates the metric standard for this result

Avg. Resp. – indicates the average response for Mechanical Engineering majors

3. ME Incoming Rotating Military Faculty Focus Group: 4.8/5.0
4. ME Graduate School Advisor Surveys: 5.0/5.0
5. Mechanical Engineering Advisory Board Survey and Results (2006): 4.67/5.0

o **Evaluation – Objective 3 Level of Achievement: 4.5 (Very Good to Outstanding)**

Level of Achievement of Program Educational Objective 4:

- o Objective 4: Demonstrate necessary leadership and teamwork skills to work in multidisciplinary team environments.

- o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

- o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Std.	Avg. Resp.
Tri	39	When confronted with a complex mechanical engineering problem, I can work effectively on a team to solve the problem.	4/5	4.60

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	4-7	Tailor leadership skills to individuals when appropriate	4/5	4.14

3. ME Incoming Rotating Military Faculty Focus Group: 5.0/5.0
4. ME Graduate School Advisor Surveys: 5.0/5.0
5. Mechanical Engineering Advisory Board Survey and Results (2006): 4.67/5.0

- o **Evaluation – Objective 4 Level of Achievement: 4 (Very Good)**

Level of Achievement of Program Educational Objective 5:

o Objective 5: Demonstrate elements of engineering practice that prepare graduates for advanced study in engineering or other technical areas to include admission into and success at top engineering graduate programs.

o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Avg. Resp.
Tri	17	I have completed the following engineering or engineering-related continuing education activity: Ph.D. in Engineering	0%
Tri	18	I have completed the following engineering or engineering-related continuing education activity: Ph.D. in engineering-related field	0%
Tri	19	I have completed the following engineering or engineering-related continuing education activity: MS/ME in Engineering	12.50%
Tri	20	I have completed the following engineering or engineering-related continuing education activity: MS in engineering-related field	6.40%
Tri	21	I have completed the following engineering or engineering-related continuing education activity: Courses leading to a graduate degree not yet obtained	20.87%

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	8-16	Undertake advanced graduate study	4/5	4.86

3. ME Incoming Rotating Military Faculty Focus Group: 4.6/5.0
4. ME Graduate School Advisor Surveys: 5.0/5.0
5. Mechanical Engineering Advisory Board Survey and Results (2006): 4.42/5.0

o **Evaluation – Objective 5 Level of Achievement: 4.5 (Very Good to Outstanding)**

Level of Achievement of Program Educational Objective 6:

o Objective 6: Communicate orally and in writing using correct and precise terms, demonstrating clear, critical thinking.

o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Std.	Avg. Resp.
Tri	40	When confronted with a complex mechanical engineering problem, I can communicate, orally and in writing an engineering solution.	4/5	4.55

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	2-7	Effectively communicate a tactical decision or Operations Order	4/5	4.71
Cdr	4-5	Communicate effectively with enlisted soldiers	4/5	4.57
Cdr	4-6	Communicate effectively with NCOs	4/5	4.57

3. ME Incoming Rotating Military Faculty Focus Group: 4.4/5.0
4. ME Graduate School Advisor Surveys: 5.0/5.0
5. Mechanical Engineering Advisory Board Survey and Results (2006): 4.58/5.0

Evaluation – Objective 6 Level of Achievement: 4.5 (Very Good to Outstanding)

Level of Achievement of Program Educational Objective 7:

o Objective 7: Commit to continuous self-improvement and life-long learning with the flexibility to adapt to changing Army needs.

o Assessment Instruments:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002
2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003
3. ME Incoming Rotating Military Faculty Focus Group
4. ME Graduate School Advisor Surveys
5. Mechanical Engineering Advisory Board Survey and Results (2006)

o Assessment Results:

1. USMA ABET Graduates Triennial Survey (Tri) for Classes of 1999 – 2002

Tool	#	Item	Std.	Avg. Resp.
Tri	6	Prepare you for your continuing education?	4/5	4.33
Tri	7	Have you taken the Fundamentals of Engineering (FE) Examination (formerly the EIT)?		100%
Tri	9	Have you taken the Professional Engineering (PE) Examination?		5.23%
Tri	13	I am confident in my ability to learn on my own - to identify what I know and don't know about a given problem and find answers to unresolved questions.	4/5	4.72
Tri	14	I am confident in my ability to learn new aspects of my position on the job.	4/5	4.79
Tri	15	I am confident in my ability to continue professional development through self-directed study.	4/5	4.56
Tri	16	I am confident in my ability to undertake advanced graduate study.	4/5	4.63
Tri	22	I have completed the following engineering or engineering-related continuing education activity: Courses not leading to a degree		13.68%
Tri	23	I have completed the following engineering or engineering-related continuing education activity: Non-credit courses taken through professional societies, universities, employers, or the Army		32.35%

Enclosure 2. Example use of Survey Data. Memorandum Subject: Survey Request for Information re: 0702-0116, West Point Graduate Surveys

2. USMA Graduates/Commanders Survey (Cdr) for Class of 2003

Tool	#	Item	Std.	Avg. Resp.
Cdr	2-14	Continue professional development through self-directed studies	4/5	4.86
Cdr	8-1	Learn on your own	4/5	5.00

3. ME Incoming Rotating Military Faculty Focus Group: 4.4/5.0
4. ME Graduate School Advisor Surveys: 5.0/5.0
6. Mechanical Engineering Advisory Board Survey and Results (2006): 4.50/5.0

Evaluation – Objective 7 Level of Achievement: 4.5 (Very Good to Outstanding)