A Teaching And Learning Initiative at the United States Military Academy

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Abstract

In the spring of 1999, the Department of Civil and Mechanical Engineering and the Department of Electrical Engineering and Computer Science at the United States Military Academy began a joint three-year Teaching and Learning Initiative. The purpose of this initiative is to improve cadet development by promoting active learning, by evolving a curriculum development process that enhances learning and growth across an integrated cadet academic experience, and to invigorate faculty teaching and scholarship by continuous development. This paper addresses the philosophy of this initiative along with visions and desired outcomes from the effort. Initial goals, objectives, performance criteria, and data collection efforts are presented. The organizational structure for the initiative is outlined to include work groups. Preliminary feedback, assessment, and results from the first year of the initiative are presented.

I. Introduction

This paper provides a road map and initial results from a three-year Teaching and Learning Initiative undertaken at the United States Military Academy. In the spring of 1999, the Department of Civil and Mechanical Engineering and the Department of Electrical Engineering and Computer Science at the United States Military Academy began a joint three-year Teaching and Learning Initiative. The purpose of this initiative is to improve cadet development by promoting active learning, by evolving a curriculum development process that enhances learning and growth across an integrated cadet academic experience, and to invigorate faculty teaching and scholarship by continuous development.

II. Teaching and Learning Initiative Philosophy

The basis for this initiative is the premise that learning is a function of the way we teach. We postulate that different styles of teaching are more effective than others depending on the situation. As noted in Kolb's Learning Cycle[1], students also have a variety of preferences for the way they learn. The more teachers understand the learning process, the more effective they can become in applying appropriate learning activities.

Figure 1 graphically displays this philosophy. The ordinate indicates the level of learning. The abscissa shows a spectrum of learning activities. To the far left are activities that involve little student involvement or input. Complete control of content and delivery lies with the faculty member. Students are in the receive mode and lack enthusiastic engagement. To the far right are events with little or no faculty involvement or input. Activities which lie more toward this end of the spectrum might include sessions where the faculty member is available if consulted, but the student completely controls the pace and direction of the exercise with little mentoring or

assistance. We believe that there exists a mix of activities that enhances learning in any given situation. Interactive engagements between students and faculty coupled with intellectual excitement pervade this optimal learning environment.[2]

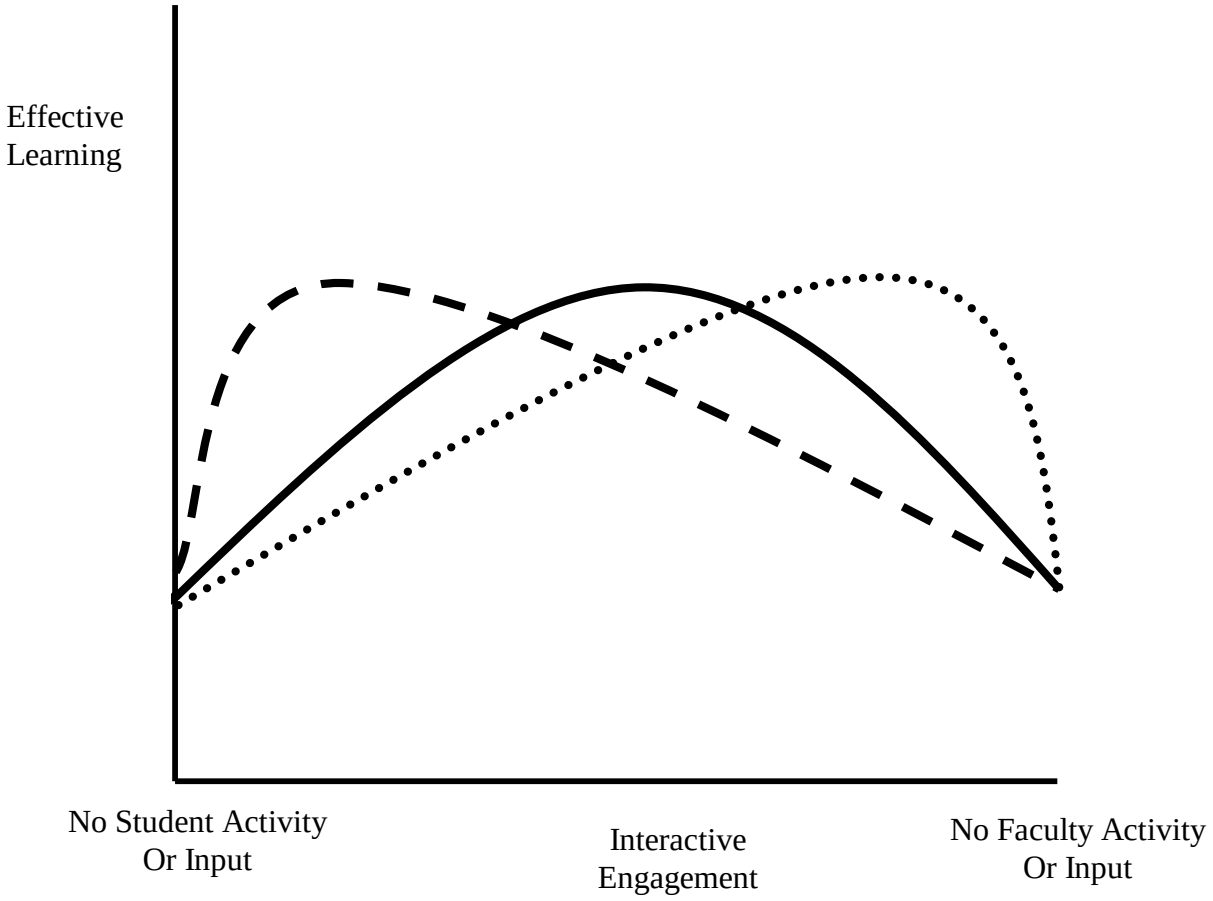

Figure 1. The Teaching and Learning Initiative Philosophy

Possible curves of the learning function are depicted in the graph. The shape of the curve can be quite different for different learning contexts. For one situation, the teacher may find the most effective method for conveying the material skewed toward heavy faculty involvement. Another learning objective might favor more student-oriented activities. The most important thing is that both teacher and student are aware of the learning dynamics and attempt to optimize the mix of learning activities as much as possible.

As teachers and students become more aware and educated in the learning process, the level of overall effective learning will increase. The goal of the Teaching and Learning Initiative is to foster this growth and move toward a higher level learning community.

III. Teaching and Learning Initiative Vision and Desired Outcomes

The vision for the Teaching and Learning Initiative strategically focuses on three areas where teachers have a direct influence on fostering the growth of the learning community. The vision outlined below was developed at a workshop conducted at the United States Military Academy in January of 1999. In addition to faculty members in the departments of Civil & Mechanical Engineering and Electrical Engineering & Computer Science, other members of the West Point faculty contributed to the development of this shared vision.

1) Active Learning
- An excitement for learning pervades the Academy.
- An environment exists that fosters cadet ownership of their learning.
- Assessment is used as the means for improving performance.

2) Faculty Development
- A structured program is in place for the continuous growth of all faculty.
- An environment exists that emphasize teachers (both civilian and military) as role models of Army values.
- There is an increased proficiency in the application of learning tools.

3) Curriculum Design
- The curriculum design process builds on the existing assessment process.
- Curriculum design concentrates on the integration of the learning experience
- Curriculum design is the responsibility of all.

At the conclusion of the January 1999 workshop, a Teaching and Learning Initiative Committee was formed of which the lead author became the chair. This committee refined the following initial outcomes to support the achievement of the shared vision.

1) Document an evolving action plan that integrates all efforts of the initiative into a coherent program.
2) Gain the support of the Dean of the Academic Board, and others who can provide resources for the initiative.
3) Integrate processes developed as part of the initiative into the existing USMA Assessment System and make these processes consistent with the requirements for accreditation under ABET Engineering Criteria 2000.
4) Continuously improve the understanding and application of active learning and assessment techniques.
5) Foster student ownership of the learning process while improving the achievement of the USMA academic program goals

To achieve the vision, the Teaching and Learning Initiative Committee outlined a broad set of goals and objectives, along with some means of measuring whether these goals and objectives are achieved (performance criteria and data collection efforts).[3] These goals are outlined below.

Goal 1: An excitement for learning pervades the Academy. An environment exists that fosters cadet ownership of their learning.

Objective: Graduate cadets who have an increasing appreciation and motivation for life-long learning during their four-year experience.

Performance Criteria: Cadets and graduates report an increased appreciation and motivation for life-long learning.

Data Collection Methods: Survey instruments, longitudinal studies, portfolios, graduating cadet interviews.

Goal 2: Enhance learning and growth across an integrated cadet academic experience.

Objective: Create a learning community environment in which teaching and learning initiatives are routinely shared between academic departments.

Performance Criteria: Conduct annual integrated new faculty and advanced faculty workshop sessions between the Departments of C&ME and EE&CS.

Data Collection Method: Document workshops, conduct after action reviews, peer assessments.

Goal 3: Develop a structured program for continuous growth of all faculty. Increase the faculties' proficiency in the application of learning tools.

Objective: Create a learning community environment where advanced teaching and learning workshops and opportunities for growth are performed and valued. The premise is that even experienced faculty members can grow in their ability to teach. Workshops for new faculty members provide basic skills. Advanced opportunities for growth provide more experiences and discussion of application of learning methods, along with actual techniques and procedures.

Performance Criteria: Conduct annual workshops and provide other opportunities that are focused on 2nd year and more senior faculty members.

Data Collection Method: Document workshops and opportunities, conduct after action reviews, peer assessments.

Goal 4: Promote an evolving curriculum development process that enhances achieving the curriculum development portion of the Teaching and Learning Initiative vision.

Objective: Learn more about curriculum design. Integrate and sequence curriculum design with the faculty development process.

Performance Criteria: Conduct curriculum design workshops to educate faculty members. Maximize opportunities to improve the curriculum design process and develop faculty members that understand and can apply the curriculum design process.

Data Collection Method: Document and improve the curriculum design process. Conduct and document workshops or other opportunities that improve the curriculum design process, Document the evolution of program and course reviews and changes.

Goal 5: Design a system in which assessment is the means for improving performance. Build on the existing USMA assessment process and complement the ABET EC2000 assessment process.

Objective: Continue to grow and improve the Teaching and Learning Initiative through assessment. Formally identify other feedback loop and assessment mechanisms for the Teaching and Learning Initiative.

Performance Criteria: Conduct ongoing and periodic assessments and analyze feedback regarding the success of implemented programs.

Data Collection Method: Survey instruments, advisory board feedback, longitudinal studies.

IV. Organizational Structure and Implementation

The Teaching and Learning Initiative Committee organized personnel from the Departments of Civil & Mechanical Engineering and Electrical Engineering & Computer Science into four work groups. (See Figure 2) The committee based the work groups on the goals and objectives of the initiative outlined in the previous section. Each work group has one Teaching and Learning Initiative Committee member who serves as mentor and coordinates work group contributions to the overall Teaching and Learning Initiative implementation. The Teaching and Learning Initiative Committee reports progress to and receives guidance from the Department Heads of the Department of Civil & Mechanical Engineering and the Department of Electrical Engineering & Computer Science.

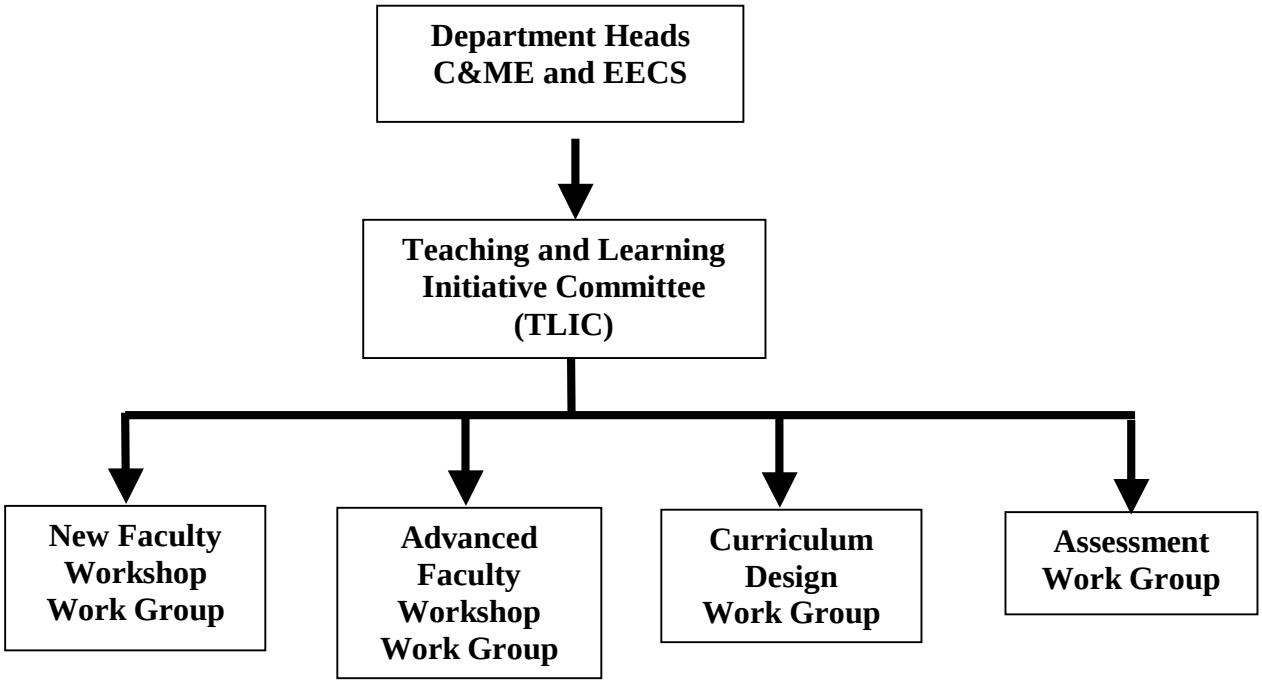

Figure 2. Teaching and Learning Initiative Organizational Chart

The Teaching and Learning Initiative committee developed initial work group charters. Work groups have been charged with reviewing these charters and developing goals, objectives, measurable performance criteria, and data collection efforts for their respective parts of the plan. Periodic progress reports are being conducted to monitor the progress of these efforts.

The co-authors are the mentor and work group leader respectively for the new faculty workshop work group. The remainder of the paper primarily focuses on the results achieved in this area of the initiative. Progress reports from the remaining work groups follow these results.

V. Preliminary Feedback, Assessment, and Results

A. New Faculty Workshop Work Group

The New Faculty Workshop Work Group formed in the late spring of 1999. At that time they developed a list of objectives to accomplish during the first summer of the Teaching and Learning Initiative. Every summer, each department at the Military Academy traditionally holds New Faculty Workshops for arriving faculty. Historically, little interaction between departments has taken place. The workshops are designed to provide the participants with the tools and the opportunity to make substantial improvement in their teaching skills and to achieve a standard of teaching excellence.

To enhance the effectiveness of the workshops and share insights among a large audience, the New Faculty Workshop Work Group decided to integrate part of the workshop experience between the departments of Civil & Mechanical Engineering and the Electrical Engineering and Computer Science. It was decided that during the summer of 1999, each department would observe one new faculty and one experienced faculty member session from the other department's workshop. The overall intent was to gain appreciation and better understanding of how the other department conducted their new faculty workshops. After each session, the faculty member began with a self-assessment of the instruction. Other members in attendance then followed with additional feedback and an overall assessment. After all of these sessions took place, the departments conducted a combined session to assess the benefits of the summer's integration and determine future steps for the new faculty workshops.

The combined assessment session took place in early fall of 1999. The benefits of the exchange centered on the exchange of various teaching styles and techniques between departments. The classes from the Department of Civil & Mechanical Engineering seemed more tightly bound by content whereas the classes taught by the Department of Electrical Engineering & Computer Science seemed less tied to content and more readily followed tangents introduced by questions from the students. Positive and negative aspects of both approaches were recognized. While the more content-based approach ensures at least some coverage of the specific learning objectives within a given amount of time, there was some concern in limiting the students' role in expanding on certain areas of interest. Allowing more student involvement for the direction of the class empowers and gives the student more control and also puts more responsibility on them for achieving the learning objectives regardless of the coverage in class.

As a result of this experience, the New Faculty Workshop Work Group decided to make adjustments to the New Faculty Workshops during the summer of 2000. The Work Group will solicit directed feedback from the each of the new and experienced faculty members that participate in the workshop. The feedback will focus on the overall goals of the Teaching and Learning Initiative to determine how well these new faculty workshops help foster an environment that encourages an excitement for learning, encourages cadet ownership of their

learning, and enhances learning and growth across an integrated cadet academic experience. Simple data, such as the teaching techniques and learning activities acquired during the summer workshop, will be collected. The Work Group plans to administer subsequent surveys at the middle and end of the following fall semester that further measure the success of the initiative by looking at how faculty members implemented techniques learned during the workshop in the actual classroom. The Center for Teaching Excellence at the United States Military Academy has volunteered to administer this survey and help consolidate and interpret the feedback.

The Work Group is also exploring the possibility of using longitudinal studies. Questions directed at the students' excitement for learning and characteristics of the learning environment that influenced their desire to learn (both negatively and positively) can elicit important results of methods that foster achievement of the overall Teaching and Learning Initiative goals.

B. Advanced Faculty Workshop Work Group

The Advanced Faculty Workshop Work Group is focused primarily on the part of the Teaching and Learning Initiative vision statement that addresses invigorating faculty teaching and scholarship by continuous development. As faculty members continuously grow, emphasis is placed on an environment that promotes teachers as role models of Army values and self-growers. Through this development, faculty members also become more proficient in applying learning tools and promoting an effective learning environment.

While this Work Group is just beginning their work toward a structured program of faculty development, they have a partial road map toward implementation. Currently, the Center for Teaching Excellence at the United States Military Academy offers workshops several times each semester to foster high-quality teaching and learning. Topics of the workshops include classroom assessment, active learning, course design, and testing techniques. These opportunities are being leveraged through the Teaching and Learning Initiative. In addition, the Department of Civil and Mechanical Engineering has implemented a teacher portfolio system. Efforts are also underway to enhance a "writing across the curriculum" initiative. Reflective workshops are being considered to capture the lessons learned from these initiatives.

C. Curriculum Design Work Group

The Curriculum Design Work Group is developing and publishing a plan to conduct Curriculum Design Workshops to educate faculty members. It is envisioned that the plan will accommodate all newly assigned faculty members within their first eighteen to twenty-four months of arrival.

It is also envisioned that each Work Group member will model the curriculum design process for their program by choosing a single course in their program and developing a curriculum for that course. The final product for each program will be a tightly integrated course design supporting program, department, academic program and United States Military Academy goals. Each design must consider the input (prerequisite) knowledge, skills, values and attributes. Each course should link a variety of learning activity types to further develop both knowledge and less tangible characteristics.

Program representatives will develop a knowledge map for each sub-program within their discipline (e.g. computer engineering within the Electrical Engineering program). The knowledge map will identify the source of the knowledge, any prerequisites, and if possible the course(s) responsible. At this level, the knowledge items are at a higher level than those found at the course level. (Example: Course-level: apply node voltage analysis to solve multi-node circuits. Program-level: solve circuits using various analysis techniques.)

Faculty members identified in each department will review the design of each course and program. These faculty members will have had the appropriate developmental experiences before the review or redesign is attempted. The overall goal is to develop, continue to improve, and sustain a long-term plan to formally assess each program and course at least once every two years.

D. Assessment Work Group

The Assessment Work Group is in the process of identifying a formal process of assessing the overall Teaching and Learning Initiative goals. As part of that assessment framework, they will recommend intervals for formal program assessments and develop a generic set of objectives that can be adapted to any of the major programs within the two departments. Performance criteria for assessment purposes are also being developed along with a methodology and structure for accomplishing assessments. Inherent in this process is integrating these assessment efforts to be compatible with the assessment efforts underway in achieving ABET EC2000 Criteria.

VI. Conclusions

This paper has provided an overview of a three year Teaching and Learning Initiative at the United States Military Academy. The philosophy of the initiative is addressed along with visions and desired outcomes from the effort. The organizational structure for the initiative was outlined along with preliminary feedback, assessment, and results from the first year of the effort. Further results of this initiative will be presented in future papers.

VII. Acknowledgements

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