

Departmental Implementation of ASCE's ExCEED Teaching Principles

Jennifer Q. Retherford¹ and Angelica M. Palomino²

Abstract – Civil Engineering professors are currently challenged with the responsibility of educating a new generation of students and the need to balance an ever-growing class size and diversity in learning styles. Effective training of professors is critical for the education of students who will be faced with many new civil engineering challenges. The American Society of Civil Engineers (ASCE) Excellence in Civil Engineering Education (ExCEED) teaching workshop promotes teaching and instructional strategies evaluated by extensive research specific to the Civil Engineering discipline. The ExCEED teaching model is a well developed teaching model that addresses organization of a lecture, presentation energy, encourages rapport with students, and assessment of student learning. This paper presents a framework for implementation of the ASCE ExCEED principles at a Civil Engineering departmental level, develops recommended best practices for incorporating ExCEED principles in existing lecture documentation, and presents the experience of implementation at the University of Tennessee.

Keywords: ASCE ExCEED, Civil Engineering

INTRODUCTION

Education of Civil and Environmental Engineering students is a challenging and ever-changing responsibility. Advancements in technology, improvements in analytical and experimental methodology, and an ever-growing need for revitalization of our infrastructure call attention to a need to provide a state-of-the-art educational experience for students in the civil and environmental engineering professions. While the advances in engineering practices have soared, so have the pedagogical principles and concepts. A significant need exists for educators of engineering students to adapt teaching methods to a student population that will be required to face highly complex engineering problems.

The American Society of Civil Engineers (ASCE) sponsors the Excellence in Civil Engineering Education (ExCEED) teaching model and training program, which has been well received by civil engineering programs across the country. The ExCEED teaching model was first developed in 1996 by faculty at the United States Military Academy at West Point as a tool to improve student learning [Estes et al., 4]. The model was specifically designed for the civil engineering student audience [ASCE, 1] and has been improved upon in the years following its initial implementation. The methodology outlined in the teaching model addresses lecture organization, provides recommendations for improving presentation energy and enthusiasm, encourages deliberate efforts to build a rapport with students, and supports frequent assessment of student learning. The ExCEED teaching model emphasizes the use of a well-organized, technical lecture presentation in conjunction with appropriate technological examples and deliberate consideration of various teaching and learning styles as they pertain to the civil and environmental engineering disciplines.

While the ExCEED teaching model is well established, implementation of this or any new teaching model is challenging to professors. Junior professors are often well trained with respect to research and engineering fundamentals, but rarely have experienced formal training in the educational fields. Additionally, many professors will be asked to teach within their first year in a tenure-track position. Training for these individuals is often informal and therefore can be difficult to implement.

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Aside from the implementation at an individual level, difficulties can arise through the department when individuals are uncertain about the value, need, or expectations of the department to adopt specific teaching principles. While the expectations for research, funding, and scholarship may have clear definitions, specific educational expectations are often vaguely described. The expectations for educational excellence are often implied, but unclear objectives are difficult to achieve, thereby difficult to quantify or evaluate fairly.

A framework for implementation of a teaching model at the department level requires a consistency in the intended objectives of the program, a support program that provides guidance to the faculty members, and a process for assessment and evaluation at the individual instructor level. The intentions of the program can be demonstrated through well defined core values that are shared with all individuals of the department. A formal educational process in conjunction with the core values allows for education of faculty members in pedagogical techniques that will improve delivery of the department's curriculum objectives. Formal assessment and evaluation are necessary to ensure standards of practice throughout the department.

The departmental framework must firmly define the expectations of the department, but must be flexible enough for individualization. A departmental teaching model must be adaptable to various teaching and learning styles while still maintaining overarching departmental core values related to education of the students in the program. This is easily attained through a teaching model that is deliberately designed around the core values of the department. Flexibility between individual faculty members is ensured by providing direct and clear expectations with intention of personalization in application and technique.

Implementing a departmental framework requires consideration of existing individual teaching philosophies. The framework should recognize that many educators are already incorporating valuable pedagogical techniques. In the initial stages of a major departmental change, resistance is expected. This is easily resolved when individuals are directly made aware of how they are already implementing many of the methods proposed in the departmental teaching model. It is thus required that the development of the teaching model include consideration of the current teaching methods in place and the desired future improvements that the department as a whole desire.

This paper presents a framework for implementation of the ASCE ExCEED principles at a Civil and Environmental Engineering departmental level, develops recommended best practices for incorporating ExCEED principles in existing lecture documentation, and presents the experience of implementation at the University of Tennessee.

IMPLEMENTATION

Implementation of departmental-wide teaching values requires departmental initiative and involvement, a well supported educational program, and dedicated individual implementation. A recommended departmental teaching model incorporating these important teaching values is presented in Figure 1.

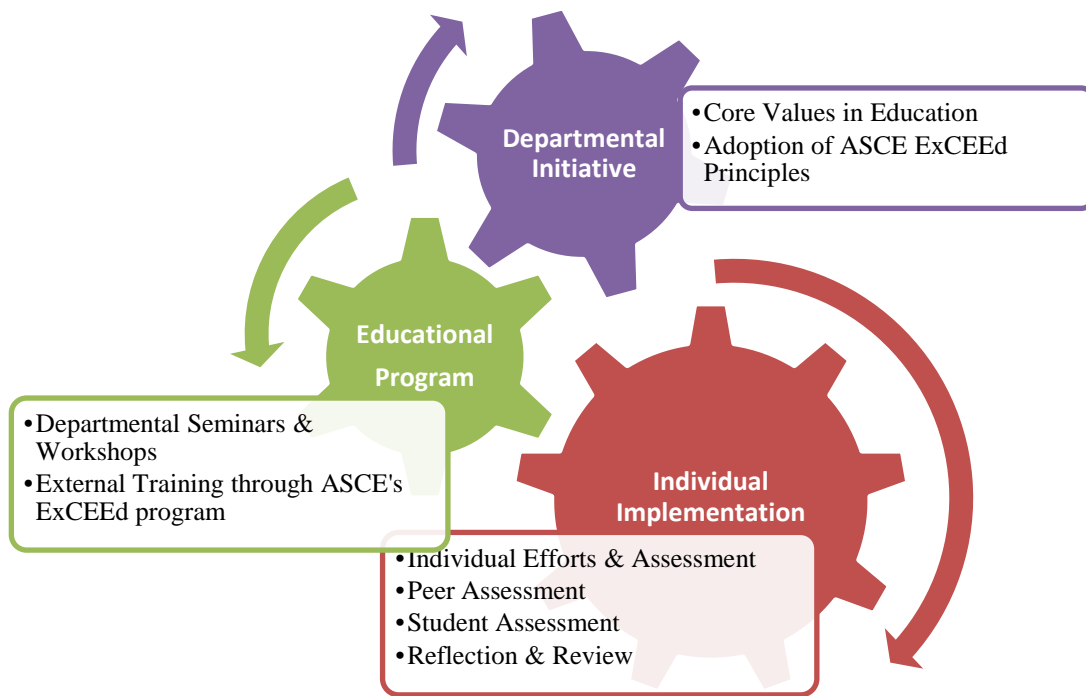


Figure 1. Departmental Teaching Model

The departmental initiative and involvement is critical in emphasizing the department's commitment to education excellence and provides guidance to the faculty. Clarity in the expectations of the department is achieved through well defined core values specifically addressing education. These core values should be included in formal activities such as training activities, peer assessments, and the formal annual review process. Core values must be formulated in a clear and direct manner, but must also allow for interpretation and implementation on an individual basis. The direct inclusion of the core values in formal evaluation activities such as an annual review process provides faculty members direct instruction on the emphasis of the department while still maintaining an environment that allows for individualization of teaching methods.

Through the support of the department, a clearly-defined educational program is necessary in creating a knowledgebase for standards of teaching at the institute and provides an opportunity for internal education related to the specific teaching values of the department. A culture of educating excellence will thrive in an environment that is supported by a strong educational program. Faculty members should be encouraged through the department's commitment to the core values related to education, and this can be enhanced by a formal process for refreshing pedagogical skills. Departmental support, both in spirit and monetarily, for external training programs is important in revitalizing the department with current pedagogy lessons. Regularly scheduled, maintained, and attended internal seminars and workshops also enhance the culture of educational excellence. Faculty members must develop a culture where education is a value and not a chore given that a supporting culture is vital to developing a positive experience in the department. Consistent forums for advice, guidance, and growth allow faculty members to share experiences and gain knowledge on how to address common classroom circumstances.

Finally, the individual faculty member must implement their personal teaching methods, ideally incorporating the departmental core values in education. The persistence of a department-wide training program, founded in common core values, will hopefully encourage individuals, but action is required on a personal basis. This can be encouraged by departmental sanctioned activities such as assessment by peers and students. Individuals should also be trained to appropriately reflect on assessment and systematically review their teaching methods to ensure consistent performance.

RECOMMENDED BEST PRACTICES

Implementation of a departmental teaching model requires support by the department, faculty leaders, and the individual. The department must embrace common objectives for the education of the students in the engineering program. All faculty members should participate in the program to develop a culture of education excellence. This culture must be supplemented by a program that provides an opportunity to develop pedagogy techniques and promote individual growth.

The development of departmental core values, an internal educational program, and individual implementation guidelines are the three components recommended to best incorporate a departmental teaching model. Development of core values for the department with specific education objectives is recommended as a formalization of the expectations of the department. An educational program provides a metric for individual growth, can revitalize pedagogy throughout the department, and improves moral amongst educators. Finally, implementation is necessary to emphasize to students and peers the level of dedication to education throughout the department.

Departmental Core Values

Success at the department level implementation is governed by a strong commitment to engineering education, which can be succinctly shared through well-defined departmental core values. These core values are necessary in clarifying to both students and faculty the expectations of the educational experience throughout their tenure in the engineering program. Clarity in the expectations of the department provides security to the faculty members as well as a tool for developing a teaching method consistent with the expectations of the program.

The proposed departmental values presented in Figure 2 are intended to clearly define the overall objectives of the department and its role in the training and education of professional engineers. For this model, the foundation of the core values lies in providing a respectful learning environment and ensuring the students are well-trained in fundamental engineering knowledge. These two components provide an opportunity for superior student achievement, which in turn, supports professional growth and ultimately leadership in the profession.

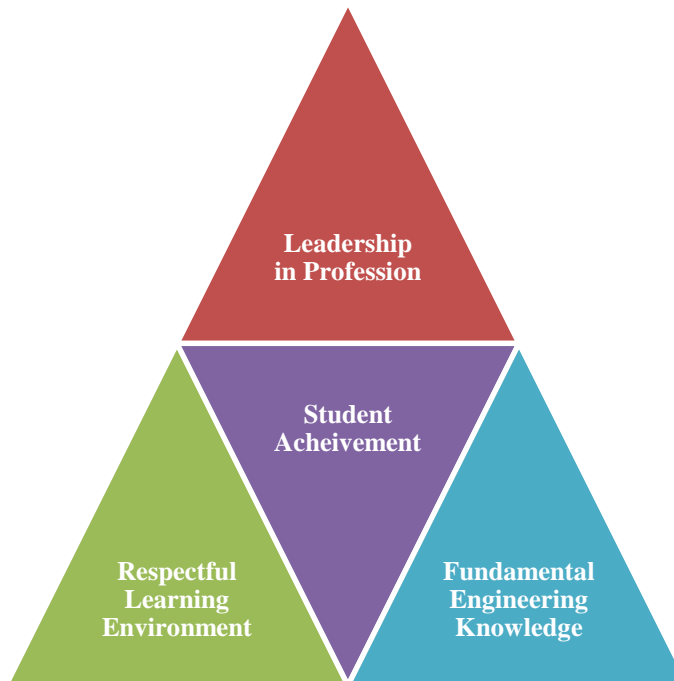


Figure 2. (Proposed) Departmental Core Values

Departmental Educational Program

A well established educational program within the department is important to the development of a culture of teaching excellence. A proposed educational program, intended for implementation at the University of Tennessee, follows the tiered relationship shown in Figure 3. Faculty members participate in departmental training that focuses

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initially on conceptual definitions and teaching principles and then tapers to more direct training related to design of a course.

The proposed Educational Program described in Figure 3 incorporates some specific ASCE ExCEED teaching model principles which have been selected in relation to the department's core values. This educational program includes ExCEED principles related to: organization of a lecture, methods for developing a successful learning environment, and appropriate assessment and evaluation methods.

Ideally, the educational program will reiterate the department's mission for education excellence and will provide an opportunity to recognize and evaluate methods that can enhance pedagogy related to the mission of the department.

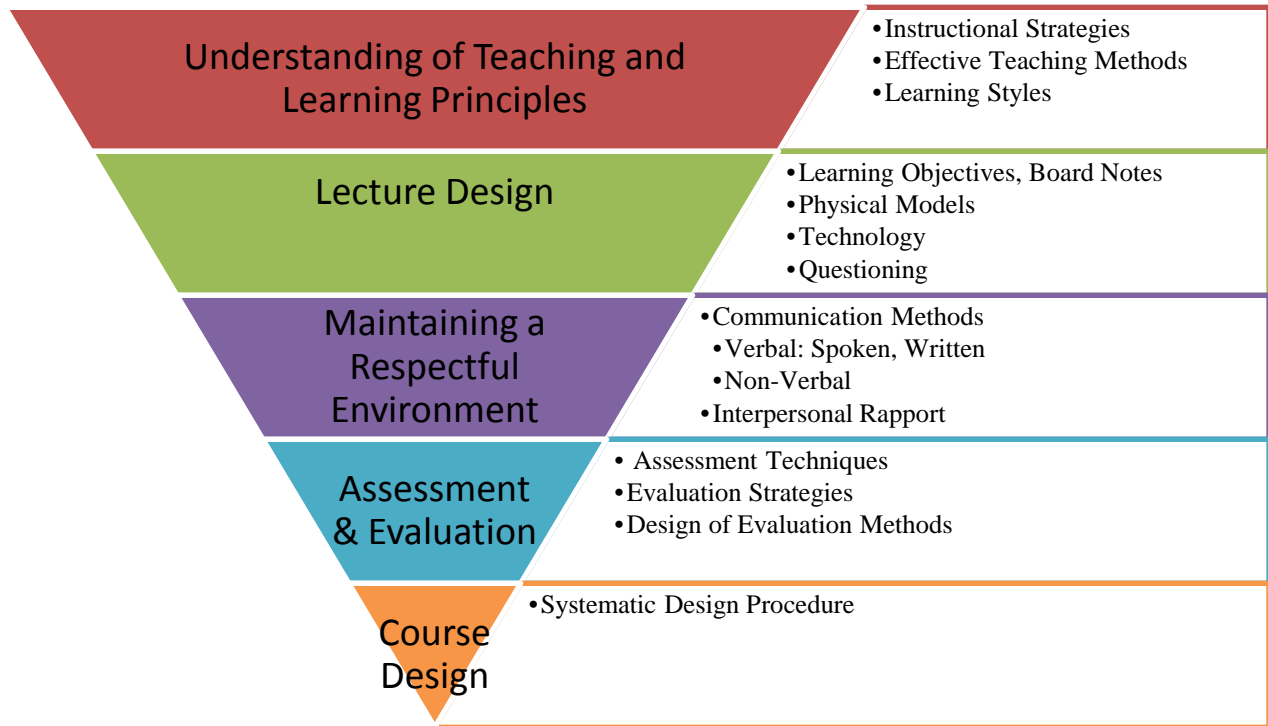


Figure 3. Departmental Educational Program

Success of a departmental training program requires a dedicated schedule for development throughout the program, support by faculty mentors, and a process for promotion into higher tiers of expertise. The program presented in Figure 3 is intended to introduce individuals to pedagogy techniques and challenges in a systematic manner related to implementation in the classroom. The program begins with understanding of teaching and learning styles as a foundation to perfecting educational techniques. An individual advances through the program next through concepts related to lecture design and creating an environment of learning in the classroom setting. These first two program components are immediately relevant to a professor who can use these concepts and techniques in their daily lectures. Advanced training consists of extending an understanding of appropriate student assessment and evaluation techniques to ensure student performance. The final stage of the program focuses on overall course design which is the culmination of developing a course that is well-organized and well-executed.

The schedule of the educational program should be cyclic, providing opportunities to engage both junior and senior faculty who have varying levels of teaching experience as well as varying levels of formal educational training. The proposed departmental educational program described in Figure 3 is intended to be repeated on a two year cycle to allow an opportunity for all individuals to be well-trained and repeatedly introduced to the concepts that formulate the overall department's educational expectations. The duration of the cycle for this model was selected with the intention of avoiding an overwhelming commitment while continually demonstrating support of the educational program. A two-year cycle presumably engages new faculty members early in their career, and will likely often support faculty after gaining some experience in the classroom. The repeated cycle will also provide veteran faculty members an opportunity to stay involved in the constantly evolving pedagogy lessons while not becoming burdened with training obligations.

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This cycle also allows for individuals to be introduced to new pedagogy and then repeatedly refreshed on concepts in a regular process. Ideally, the educational program promotes continued education in the topic of engineering pedagogy. A regulated cycle allows individual faculty members to adhere to a regimen of continued education that is inherent to the culture of educational excellence within the department. Many faculty members are sincere in their development as educators, and a regular forum for discussion, learning, and reflection on teaching methods and concepts will provide individuals an opportunity to quantify continued growth in this area of their professional career. The tiered cycle also allows for individuals to achieve various levels of pedagogical skill. The department, or individuals, can assess their desired level of knowledge in the areas defined by the educational program. Individuals in advanced careers necessarily need to develop and refine courses, which constitutes the most superior tier of learning in the program presented in Figure 3. Junior faculty, with many various obligations to the department, might be designated or assigned to achieve a minimum level of knowledge related to the principles of teaching and learning styles as well as general lecture design and forgo upper tiers of knowledge to later stages in their careers.

Select faculty members should be designated as sources of information and available resources for assessment and reflection. The educational program requires steady guidance and continued commitment to ensure success. The individuals responsible for developing, organizing, and executing the educational program can be designated in various ways. Election by peers, assignment by the department head, or voluntary assignment are all possible methods for determining the individuals who will be responsible for the educational program. Duration of this appointment is also flexible, depending on the overall organization of the department and other departmental obligations defined within the school. One recommendation is to utilize faculty whose career aspirations are significantly driven by engineering education. Lecturers or teaching-only faculty are excellent candidates for this role as their existing job obligations often incorporate excellence in education.

Support for Individual Professors

Regardless of the departmental resources, the ultimate success of any teaching model is achieved by the individual educator. Support is necessary for every faculty member to ensure that the individual is provided adequate training for success in the classroom, and each instructor should be held accountable for the performance in the classroom. A reoccurring evaluation process, similar to that shown in Figure 4 provides an opportunity for directed, individual instructor growth.

The departmental training program provides a scheduled and measurable system for assessing an individual's implementation of the department's core values in engineering education. The assessment of a faculty member's performance should not be a judgment of the individual's teaching principles or philosophies, but only an assessment with respect to defined core values. This is necessary to ensure that regardless of the practices of the individual educator, the universal core values are instilled in every student in a consistent manner across the department.

A faculty member, in conjunction with the department head, is responsible for performing assessment of the individual's implementation of departmental standards in education. The assessment by the individual can be performed according to the needs of the individual, but it is recommended that this assessment occur in conjunction with the annual review process. The insight from the individual, peers, and the supervisor is adequately performed on an annual or semi-annual basis, but likely does not require constant attention. While we should constantly strive to improve, it is recommended to avoid such repetitive assessment that the individual feels under constant scrutiny.

Reflection by the individual, with peers, and with a supervisor will be vital in improving education standards in the department. In addition to the act of assessment, reflection is necessary to recognize necessary improvements and formalize the steps towards improved performance.

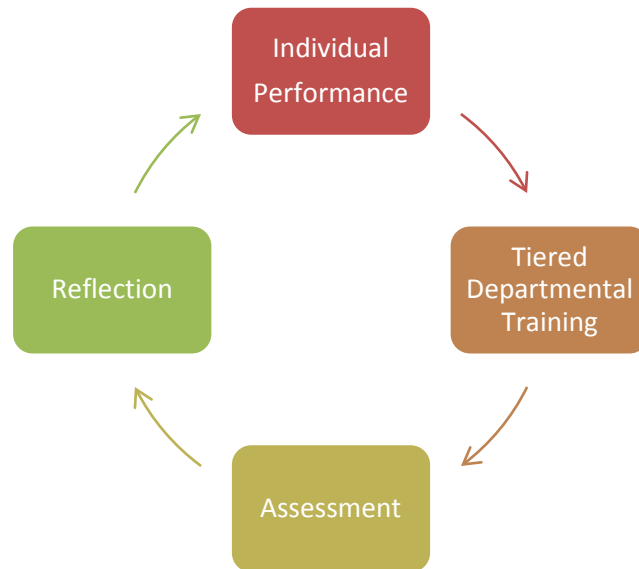


Figure 4. Individual Implementation Program

CASE STUDY

The framework described in the previous section is in the early stages of implementation in the Civil and Environmental Engineering program at the University of Tennessee, Knoxville.

Initial Faculty Teaching Practices and Principles

Prior to implementation of this framework, a few faculty members were observed in the classroom to determine the current state of educational practices in the department. Two senior faculty members were observed during typical lecture courses and an assessment was performed according to the ASCE ExCEED method. This assessment included use of the ExCEED assessment form, but, more importantly, with consideration of the ExCEED teaching method and fundamental concepts.

The assessment of the faculty, who had not previously been trained in the ExCEED model, demonstrated that many of the proven pedagogy used in the development of the ExCEED model were already implemented by these faculty members. Specifically, each of the professors observed provided a structured lecture with well-prepared lecture notes. Both presentations were engaging and their enthusiasm for the subject material was demonstrated throughout the presentations. While use of improved questioning methods, consideration of various learning styles, and appropriate use of technology could be improved, each professor demonstrated a very effective teaching method. It is likely that many other faculty members implement successful teaching techniques, regardless of involvement in formal training programs. The implementation of a formal, departmental instructional strategy and training program will supplement the expertise of many of the faculty members and is intended to bring awareness to educational techniques that may improve effectiveness of their current methods.

Faculty Survey

Surveys of all faculty instructors in the department were completed to evaluate the current teaching practices and determine the impact of implementation of a departmental level teaching model. The surveys were completed by the department's 18 full-time instructor faculty members in the department, including lecturers, assistant professors, associate, and full professors. The surveys did not include research-only faculty or adjunct faculty members.

The information provided by the faculty member surveys indicates a strong desire to collaborate to develop a culture of educational excellent by the faculty of the department. Two questions were designed to investigate the faculty's opinion on the importance of both a personal and a departmental instructional strategy. The results for all faculty members are presented in Figure 5.

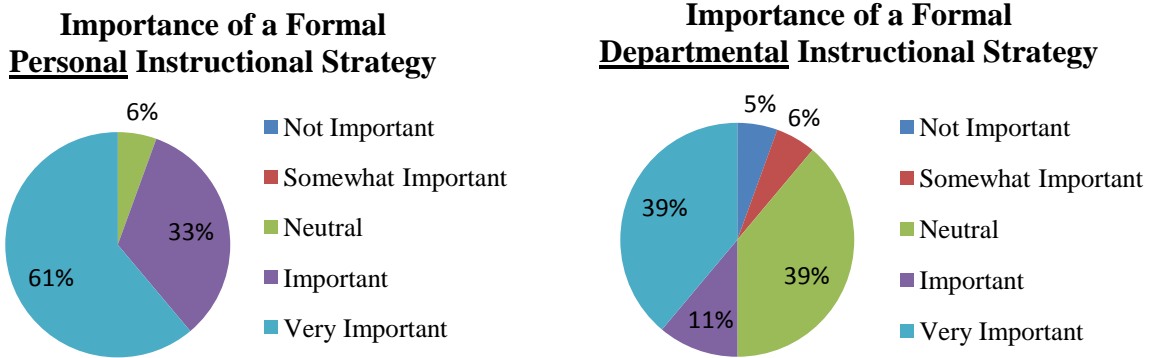


Figure 5. Importance of Formal Instructional Strategy to Faculty

Interestingly, a majority of the faculty members surveyed considered the use of a formal instructional strategy to be very important. This opinion clearly demonstrates a department-wide interest in providing a valuable learning experience in the classroom. The faculty members also responded positively towards the implementation of a departmental instructional strategy. While 50% of the respondents considered a departmental standard to be important, only 11% appear to be opposed or see little importance to a departmental standard.

The proposed instructional strategy recommended for implementation follows the primary principles of the ASCE ExCEED teaching model. It is assumed that the neutral respondents to the proposal of a departmental model will view a standard favorably if the model incorporates principles and methods already in use by these faculty members. Without direct reference to the ExCEED teaching model, all faculty members were surveyed regarding their perception of the importance of a few key principles in the ExCEED teaching model. The results of this survey, presented in Figure 6, demonstrate an understanding of key principles in effective education of engineering students that many individuals in the department intuitively understood. The faculty members clearly value the principles that comprise the ExCEED teaching model and, again, have likely adopted teaching methods that incorporate these proved components of effective teaching. Further continuing education on these principles will engage faculty in the development of a departmental instructional style that complements their existing teaching methods.

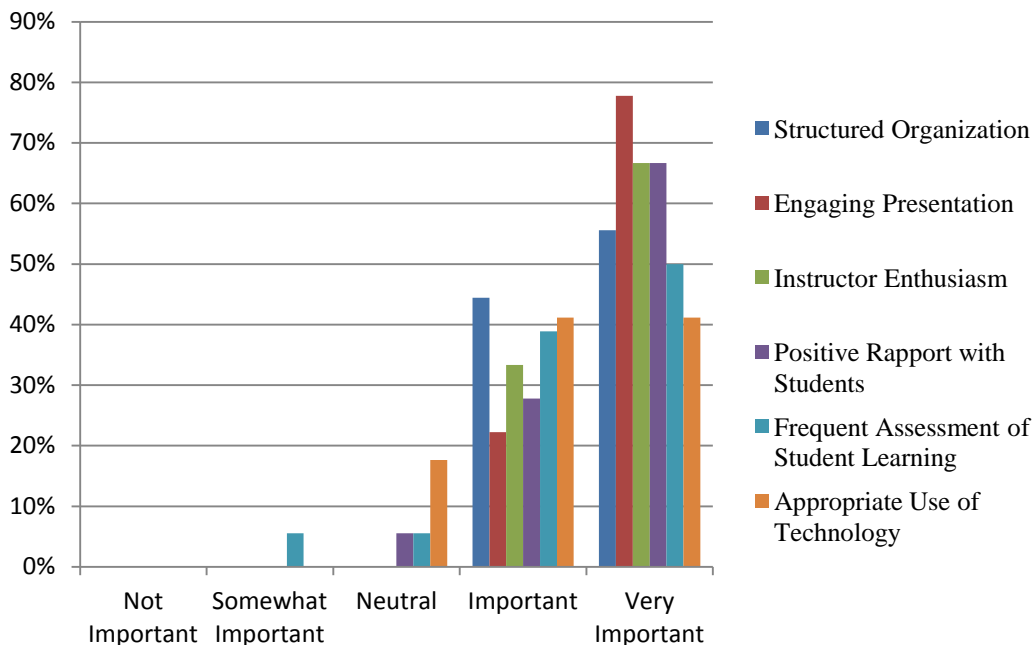


Figure 6. Importance of ExCEED Teaching Model Components to Effective Teaching

Departmental Educational Program Workshops

A series of workshops were held in the CEE department at the University of Tennessee in the Fall of 2013 that covered content related to the first two tiers of the Departmental Educational Program illustrated in Figure 3. The workshops consisted of four, one hour-long sessions held during a single week. Faculty members were strongly encouraged to participate in the workshops, though participation was not required.

The purpose of the educational workshops was to share principles and practices recommended by the ASCE ExCEED teaching model [Estes, Welch, and Ressler, 3]. An introduction to the value of a well-designed instructional strategy, or teaching model, was presented to the faculty. This introduction also included discussions related to effective teaching principles, Lowman’s two-dimensional model of teaching [Lowman, 5], various learning styles, and references available related to the ASCE ExCEED teaching model. Following the introduction, preliminary lessons were presented, following the format of the ExCEED teaching model. Figure 7 presents the major components of the ExCEED model and the relationship to the workshop topics.

ASCE’s ExCEED Teaching Model Components	Departmental Workshop Series	Fall 2013
Structured Organization	Learning Objectives, Board Notes	
Engaging Presentation	Physical Models	
Enthusiasm		
Positive Rapport with Students		
Frequent Assessment of Student Learning	Effective Questioning	
Appropriate Use of Technology	Use of Technology	

Figure 7. Departmental Educational Training Workshop: Sharing ExCEED Fundamentals

Revised Faculty Teaching Practices and Principles

Feedback was requested from faculty members after participation in the educational program workshops to gauge the immediate reaction to the ExCEED teaching model. The participants indicated that many incorporated components of the ExCEED model in their existing teaching methods. Of the concepts presented, effective questioning was the most common new teaching concept that faculty member incorporated into their lectures after participation in the workshop series. Five (out of 18) faculty members indicated they incorporated the use of questioning in a more intentional and deliberate way after participation in the workshops. While a majority of the professors engaged students in questioning during lecture, the workshops highlighted the value of varying the questioning techniques. This showed excellent promise to the educational excellence that the department requires from the faculty.

Faculty members also indicated a dedicated use of learning objectives during their lectures. Nearly 50% of the faculty utilized learning objectives prior to participation in the departmental workshops and an additional three faculty members began use of learning objectives after the workshops, resulting in a 61% majority of faculty members utilizing this aspect of the proposed teaching model. More importantly, the faculty members have been encouraged to incorporate the use of action verbs to enhance the effectiveness of the learning objectives. Bloom’s taxonomy [Bloom et al., 2] has been adopted by the department, as recommended by the ExCEED teaching model, as a valuable tool for constructing learning objectives.

CONCLUSIONS

The implementation of a formal framework for implementing departmental teaching values is valuable in creating a reliable learning environment for civil engineering students. The faculty in the Civil and Environmental Engineering department at the University of Tennessee responded favorably to the implementation of a departmental instructional strategy. Although many teaching methods exist, the ASCE ExCEED model is an excellent example of a model designed specifically for the civil engineering discipline. The ExCEED teaching model is a well-referenced

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and well-designed model that allows for individualization, but maintains consistent principles which should aid in improving student education. Additionally, the case study here highlights the similarities between the existing practices of faculty and the ExCEED model. Implementation of a like-minded model will improve adoption by the members of the faculty and should only improve teaching practice.

The departmental teaching model standard presented here does not include only the adoption of the ASCE ExCEED model, but must be thoroughly integrated in the continuing education and assessment of faculty educational performance. The framework presented herein describes the value of developing core values for education in the department, supporting a system of continuing education, and supporting individual implementation of the teaching model. This framework is integral with peer evaluations for annual review and retention policies to ensure that faculty members fully understand the metrics to be considered related to educational performance.

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