

Implementation of a Web-Based Curriculum in Architectural Engineering Technology

Bluefield State College Center for Applied Research and Technology

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1. Abstract

This paper highlights continuing work within the Bluefield State College (BSC) Center for Applied Research and Technology (CART), to deliver our web-based baccalaureate degree program in Architectural Engineering Technology (ARET). Capitalizing on the initial success of our previous web-based courses for the School of Engineering Technology and Computer Science (SETCS), we continue to increase the number and improve the quality of course offerings. A primary goal of the program is to provide an on-line curriculum that remains TAC-ABET accredited by conforming to TAC-ABET requirements to ensure the quality of the on-line ARET courses. Development, applications, and testing of our course delivery method are addressed. The curriculum has been designed to operate in our own interactive web-based environment for submission of coursework; concept diagrams, drawings, reports, assorted forms, and programming. Project submissions will be uploaded through our own CART Course Management System (CMS) for review, grading, and posted to the CMS for the student to review. Students provide feedback evaluation visible to the Dean and campus assessment office via password, and the lessons learned from data become part of the continuous improvement plan for the ARET program.

2. Introduction

Implementation of a Web Curriculum in Architectural Engineering Technology (ARET) at Bluefield State College (BSC) will strengthen our capacity to continually improve the quality of undergraduate education for students seeking careers and graduate study in architecture, engineering and construction (AEC) professions. Implementation of our comprehensive technology-based approach will directly improve student opportunities to gain access to high quality teaching and learning environments, while increasing both the number and diversity of underrepresented students, women, and region bound students and persons with disabilities seeking meaningful participation and leadership roles in the AEC professions. Web-based strategies provide the most cost-effective mechanisms for BSC to transcend regional bounds and engage in a more global approach to better prepare engineering technologists for modern workplace literacy and cultural awareness. Based on the implementation plan that follows, we will seek funding for the project that will accomplish these goals by implementing activities meeting the following objectives: (1) continually improve our ARET program through thoughtful course development, assessed content revisions, and web enhancement while ensuring quality through TAC of ABET accreditation; (2) increase support for our undergraduate students by

concentrating resources toward their academic success and educational enrichment, supporting retention and quality preparation; (3) enhance the professional development of our faculty through support for significant participation in workshops, training, applied research, sabbaticals and exchange, while affording opportunities for visiting professorships, industrial partnerships, and contributing attendance to AEC disciplinary and topical seminars.

The project addresses a major challenge facing undergraduate education by providing cost-effective web-based universal access and increasing participation to the open admissions commuter college that maintains high quality programs but is challenged by the critical mass problems associated with lower enrollment. The goals and objectives of this project will require technology and academic innovation; they enjoy a record of initial success, are worthwhile pursuits consistent with the ultimate aims of our industry, and have proven realistic in smaller scale execution. The project has the potential for improving student learning of important AEC principles through the creation of innovative and supportive web enhanced learning environments that retain the best traditions of small college student-teacher interaction ratios. Implementation will be guided and kept informed by the latest Sloan Consortium research in web-based teaching and learning, current pedagogical issues within TAC of ABET, feedback from our own assessment office, and applied research of relevant literature. If we are able to adequately fund this work, it will provide for effective assessment of student learning through timely and secure access to student evaluations of course, instructor, and online management systems which will provide feedback for continual improvement of the proposed educational objectives and practices. The project is designed to account for the background, preparation, and experience of the underrepresented and rural student by maintaining accessible enrollment, creating student guides to success, providing materials on CD where low connection speeds are present, offering threshold pre-technical developmental courses, staffing help desks for questions, and supporting scholarships for applied research, mentoring, and internship. Potential exists to provide fundamental improvements in teaching and learning through effective uses of web-based technologies that allow around-the-clock access to the learning environment that encourages the working student to participate and faculty to support the applied research activities also included in the program. The work will be led by and supported by the involvement of capable faculty who have recently completed research on web-based environments and developed our own course management system (CMS) and collectively have over 105 years relevant experience in education, research and industry. This ongoing work is championed by both the Dean of the School for Engineering Technology and Computer Science and the Vice President for Academic and Student Affairs. It is currently supported by web course management fees, adequate facilities for small scale pilots, and initial resources approved by the BSC Board of Governors and the President earlier this year.

Successful implementation of this project will contribute to the body of knowledge for activities that enhance student learning through seamless web-based reporting of course delivery activity and online assessment access. The proposed course, curriculum, faculty professional development, experiential learning, or laboratory activities are integrated

into the BSC Center for Applied Research and Technology (CART) mission and vision and the overall goals of the college. Plans for evaluation of the project will be developed through the BSC assessment office and will be designed for the size and scope of the undertaking. The resulting assessment of our work would likely be useful to similar institutions. Based on our web-based dissemination strategy, plans for producing, marketing and distributing content and services will be scalable, cost effective, accessible, and appropriate for the academic setting. The project will enhance the current status of engineering technician education through timely adaptation of content and technology, resulting in solid content and pedagogical preparation of AEC associated faculty and teachers returning to the engineering technology classroom.

3. Project Description

Background - Bluefield State College was established as a Black Teacher's College by an act of the West Virginia Legislature in 1895 and was integrated after 1954. By the 1960's, the college had a comprehensive four-year program of teacher education, arts and sciences, and engineering technology. Gradually, a variety of two-year technical programs evolved in response to local needs. Bluefield State College has emerged as a four-year state supported commuter college serving southeastern West Virginia with a primary thrust in the direction of professional and technical two- and four-year programs. The liberal arts offerings of the college are focused to enhance its unique mission. The college offers baccalaureate and associate degrees. Instructional programs are offered in engineering technologies, business, teacher education, arts and sciences, nursing and health science professions, and a variety of career fields. Students may also complete the non-traditional Regents Bachelor of Arts degree through Bluefield State College. One of the many strengths of the college has been the "two-plus-two" design of many of its baccalaureate level programs whereby the two years completed for an associate degree are applicable toward the baccalaureate degree. Bluefield State College is also dedicated to offering a wide variety of off campus and online courses.

The mission of Bluefield State College is to provide students an affordable, universally accessible opportunity for public higher education. The college demonstrates its commitment to undergraduate education by providing a dedicated faculty and staff, quality educational programs, and strong student support services in a caring environment. All programs are designed to promote the student's intellectual, personal, ethical, and cultural development. As a historically black institution, Bluefield State College prepares students for challenging careers, graduate study, informed citizenship, community involvement, and public service in an ever-changing global society. The college serves the citizens of southeast West Virginia by providing programs principally at sites in Mercer, Greenbrier, Monroe, McDowell, Raleigh, Pocahontas and Summers counties and in some locations contiguous to its service area.

Context - The CART Course Management System (CMS) was developed by the Center for Applied Research & Technology, Inc., established on 28 July 1998 to enhance the competitive position of Bluefield State College for applied research opportunities in the current environment for research and development. Its goals are to promote the general economic development of the region; expedite and simplify the acquisition and utilization

of research contracts; improve technology transfer; and link applied scientific research and technological advancements to economic development of the State of West Virginia. CART is a non-profit, non-stock corporation under the general corporation laws of the state organized exclusively for educational and scientific purposes within the meaning of section 501(c) [26 U.S.C. § 501(c) of the Internal Revenue Code of 1986, as amended, to foster and support applied research at the Bluefield State College School for Engineering Technology & Computer Science and to provide evaluation, development, patenting, management and marketing for the inventions and diverse service capabilities of its students, faculty, and staff. CART operations are subject to an independent audit.

The Architectural Engineering Technology (ARET) baccalaureate program has been TAC of ABET accredited since 1992. Students are provided the opportunity to analyze the role of architecture in the building construction industry. Course work has involved developing skills in graphic communication, CAD proficiency, building design, and the basic engineering and analysis of building structures. Graduates are provided with a wide range of employment and graduate school opportunities in architectural design, construction estimating, general contracting, government planning agencies, and building material science.

Since the inception of the B.S. ARET program, we have been concerned with increasing our enrollment while retaining program quality. This led to the interest in developing a web-based curriculum that could reach prospective students outside our traditional service area. We have had considerable success in delivering ARET 212 Applied Project Management via our own CART-CMS and want to explore the possibility of using it more extensively throughout the curriculum. This expansion of web-based delivery presents obvious and not so obvious challenges particular to the delivery of an ARET online curriculum. We are critically analyzing the advantages and disadvantages of such program delivery.

Current Capability - The program offered by the BSC Department of Architectural Engineering Technology has been designed to provide graduates with the technical and managerial skills necessary to enter careers in the planning, design, construction, operation or maintenance of the built environment. Graduates of the associate degree programs have strengths in their knowledge of the building, testing, operation, and maintenance of building systems and possess the ability to produce and utilize basic construction documents and perform basic analysis and design of system components. The baccalaureate degree program provides graduates that are able to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of architectural projects. The curriculum is outlined below:

ARET Core Elements	(12 credit hours)
CIET Requirements	(12 credit hours)
ENGR Requirements	(6 credits hours)
General Electives	(12 credit hours)
Technical Electives	(3 credit hours)

Fifth Semester

ARET 301 Institutional Design	(4 credit hours)
ARET 205 History of Architecture	(3 credit hours)
MATH 230 Calculus II	(4 credit hours)
ENGR 313 Engineering Mechanics	(3 credit hours)

Sixth Semester

ARET 313 Applied Project Management	(3 credit hours)
ARET 306 Site Planning	(3 credit hours)
SPCH 208 Fundamentals of Speech	(3 credit hours)
ARET 316 Technical Presentations	(3 credit hours)
CIET 212 Hydraulics	(3 credit hours)

Seventh Semester

CIET 207 Soil Mechanics	(3 credit hours)
CIET 401 Adv Structural Analysis	(3 credit hours)
ENGR 315 Engineering Economics	(3 credit hours)
ENGL 201 or 205 Humanistic or Modern Traditions	(3 credit hours)
Elective	(3 credit hours)

Eighth Semester

ARET 402 Senior Design Studio	(3 credit hours)
CIET 402 Structural Steel Design	(3 credit hours)
Technical Elective	(3 credit hours)
One Social or Cultural Elective	(3 credit hours)
Art, Music, or Humanities Elective	(3 credit hours)

The baseline data describing the current state of our AEC-related programs and our capacity for improvement can be illustrated in tables available from the College's assessment office page at www.bluefieldstate.edu. The scope and impact of the project in terms of the numbers of students and faculty that will be involved in each activity is initially based on the overall data for the college. As illustrated in the assessment data, even a modest percentage increase in the underrepresented categories would have a significant impact on the number and makeup of our student population within the School of Engineering Technology and Computer Science.

When additionally sorted for age distribution and gender it is revealed that we are already serving a slightly older student clientele compared to other colleges similar to ours. This project would prove to further increase the participation from these student groups by creating more accessible programs for working adult learners returning to undergraduate studies. The age distribution appears to trend up and this phenomenon has generally had a positive impact on class discussions, group projects, and applied research strengthened

by the maturity of these students. The percentage of women attending our college is also trending upward and this is likely consistent with the experiences of other colleges. However, this is not evidenced as much in the AEC-related programs possibly due to preparation, traditional norms, and the inflexible laboratory hours associated with these programs. This project serves to alleviate some of these constraints while retaining rigor and accountability within the course of study.

The relationship between the our project goals and objectives and the long-term AEC industry goals and mission of the Bluefield State College Center for Applied Research and Technology can be described as a “lock-step” parallel course. The college maintains high quality programs at relatively low costs for the student, but as can be readily seen from the data provided above, these programs are challenged by low enrollment and lacking in critical mass diversity percentages necessary to sustain vibrant and varied programs in the long term. Achieving the project goals and objectives of our industry partners will greatly benefit both parties in partnership. The lesson learned from this work will pay dividends to our college and other similar institutions looking to apply the best practices of web-based education technologies to their programs.

The institution has a commitment to undergraduate AEC education based on its long history of concentrating on this family of programs dating back to the 1940’s and more formally since the 1960’s. The college must also become more self-sufficient in regard to funding from the State of West Virginia, which continues to decline as a percentage and in hard numbers. This means that BSC must increase outreach activities to market its best products and services, which include nationally accredited and award-winning engineering technology programs. These programs have been our best kept secret for far too long. The President of the College regularly calls for increased applied research activities, faculty professional development leading to doctoral degrees, developing state of the art infrastructure and facilities, and of course, continual increases in our enrollment.

4. Proposed Activities

Course and curriculum development, revision, and enhancement:

CART will **revise AEC gate-keeping and bottleneck courses** such as introductory computer skills by adapting course titles such as “Computers and Society” and “PC Software Applications” to an accessible web-based environment, thereby establishing the foundation for future interaction in other courses over the web. Pre-technical mathematics will be offered as a self-paced digital laboratory with CD-ROM support materials for those students who need refreshing on the subject. This will serve groups that otherwise might find it difficult to make the transition to undergraduate AEC courses for a variety of reasons described earlier in the proposal. Our live pre-technical mathematics course has proven to assist many students to achieve the goal of degree completion over the past three decades. The activity can be staffed with existing and adjunct faculty and administrators, which will help increase our overall graduation rates by 50 percent by the end of three years and 100 percent in five years.

CART will **develop, adapt, and/or implement new instructional materials**, creating a new and unique version of the entire ARET curriculum. The implementation of the online courses will require digital adaptations of existing course materials to be utilized in the online accessible format. Our CART-CMS system has created and maintains a series of web-delivered courses that are currently being offered and has also provided technical assistance to the development of new online courses. Based on the initial success of these offerings, CART will hire a full-time webmaster and employ student assistants to guide this effort. We will provide for completion of the junior and senior years of the baccalaureate degree within three years and for the self-sufficiency of the entire online program within five years. While this program is directed primarily toward the ARET program curriculum, the program will serve as a model for other SETSC and partner institution programs. Other program offerings can be adapted and fine tuned to their specializations.

CART will **develop and introduce new AEC program offerings** by enhancing existing partnerships with several selected two- and four-year institutions, including Fairmont State College, for the specific purpose of expanding curriculum offerings to all institutions. These partnerships will provide opportunities for sharing of online courses and faculty between institutions and provide access to additional specializations within architecture curricula. The completion of this project would lead to the creation of a pre-engineering program relationship with other universities within three years and our own engineering technology-related Masters of Science degree offered through Bluefield State College by the end of the five-years if adequately funded.

CART will **incorporate advances in science and engineering knowledge into courses and laboratories** by utilizing the latest digital tools for creating, exchanging, presenting and communicating architectural space utilization, schematic designs, presentations, and working drawings. This activity is vital to the proper delivery of any state of the art architectural program curriculum. The CART-CMS webmaster will work with program faculty to research and develop best practices for digital file exchange and grading, so that by the end of year three the junior and senior level courses of our baccalaureate program could be administered online and the entire program by the close of year five.

CART will **implement research based teaching and learning techniques and practices** by championing the open-ended discovery of ideas through project-based teaching and natural association of applied research with architectural education. Our experience has shown that students respond well to application-based research and demonstrate more self-motivation and self-discipline when challenged to solve real problems. The project manager will work closely with our industrial partners to identify project opportunities that fit well with the objectives of all concerned. CART seeks to regularly support fifteen Applied Research Assistant Program (ARAP) students within three years and thirty ARAP students within five years.

CART will **integrate technology into ARET curricula and instruction and enhance AEC related equipment available for undergraduate education** by utilizing the

Autodesk® Buzz-saw® online project collaboration service to allow continuous communication and management of design and construction coursework and projects. This service provides the program with the ability to manage submissions, grading and return of projects that requires sharing and tracking a great deal of information. In addition to these technologies geared toward finished architectural designs, Sketch-Up® will be employed to explore preliminary architectural ideas leading to a finished and assessable building design.

The program will require the use of modern software tools; Autodesk Architectural Desktop, Architectural Studio and Sketch-Up® from @Last Software to further integrate technology into the curriculum and instruction. Through these tools the CART-CMS will be continually improved to facilitate the on-line testing vignette process. The CART-CMS webmaster will work with program faculty to research and develop best practices for digital file exchange and grading, so that by the end of year three, the junior and senior level courses of our baccalaureate program can be administered online and the entire program by the close of year five.

CART will **integrate student research and other active learning opportunities into ARET curricula** by including as an integral part of the ARET online program the expansion of the Applied Research Assistant Program (ARAP) to include more department students. The ARAP is a scholarship based initiative, providing ARET students with the opportunity to apply practical work experience in the completion of some course credits, build a stronger resume, and offset some of the costs of attending, while working with local architectural offices and industrial corporations. Adequate funding would also facilitate student assistance in research capacities: providing CART-CMS operational activities support, staffing help desks, researching new online practices, and providing tutorials for new students. CART seeks to regularly support fifteen ARAP students within three years and thirty ARAP students within five years.

Undergraduate students support services, academic success, and educational enrichment:

CART-ARAP and the CMS will enrich **research opportunities for undergraduate students on-campus or off-site** by helping enrollment become even more accessible through our online course management system and support from our industrial advisers. The successful application of these initiatives in concert will afford students the opportunity to pursue academic success with greater access, less distraction from unrelated employment, and provide a stronger foundation for future graduate study and employability. The project manager will work closely with our industrial partners to identify project opportunities that fit well with the objectives of all concerned. CART plans to regularly support fifteen ARAP students within three years and thirty ARAP students within five years.

CART will support **internships or cooperative education opportunities** through ARAP which is essentially a low-residency internship where students will be financially supportive through cooperative agreements beneficial to both our students and the

industrial partners, which include architects, engineers, manufacturers, and other service industries. The project manager will work closely with our industrial partners to identify project opportunities that fit well with the objectives of all concerned. CART will regularly support fifteen ARAP students within three years and thirty ARAP students within five years.

CART will support **undergraduate ARET scholarships and awards**. The ARAP currently provides tuition and fees scholarships, and books stipends to assist students with tuition, fees, and textbooks on a very small scale. The expanded online program will create a pilot program to test and refine aspects of the new curriculum. Students, participating in the program, will receive scholarships for tuition and fees, license copies of all required software and copies of textbooks and CDs where off-line course materials are required. Underrepresented groups, such as mid-career adults will especially benefited from the increased accessibility and scholarship support. The program manager will establish a committee to identify and suggest students eligible for scholarships and awards. CART will regularly support fifteen ARAP student scholarship awardees within three years and thirty ARAP awardees by the end of the fifth year.

CART will augment **tutoring services- peer, faculty and professional** by publishing a set of documents; "A Student Guide to the CART-CMS" and "A Faculty Guide to the CART-CMS" on CD and online, along with guides to participating in the ARAP. In addition, help desks will be staffed to handle inevitable questions and increased the comfort levels of students with the new format. The CART-CMS webmaster will work with program faculty and student support services to research and develop best practices for tutoring and staffing the help desk, so that by the end of year three the junior and senior level courses of our baccalaureate program can be administered online and the entire program by the close of year five.

CART will **increase access to computer labs and AEC equipment** by improving computer laboratories and testing facilities needed to maintain the latest and best technology. This will increase access to both online and off-line education; CAD tools and proctored test sites will be a particularly important concentration for the AEC related equipment. The program manager will work with the CART-CMS webmaster to employ the most cost-effective technologies increasing access while enhancing security. One CART-CMS support lab will be online by the end of year one and the second will be added by the end of year three.

CART will support **travel for presentations at research conferences** through funding of this project for travel to nationally sponsored conferences such as the American Society of Engineering Educators (ASEE), AEC disciplinary and topical seminars and others. Increased funding will allow both students and faculty to share our unique perspectives with others who could benefit from the presentation of our research. Program participants will participate in three national conferences per year throughout the five year period.

CART will augment **advising and counseling services** by enhancing our online offerings and applied research efforts that will afford faculty more flexible time for meaningful interaction with our students in advising and counseling capacities. Students empowered by relevant employment supervised by faculty and faculty enabled to teach with the latest technology will create synergies of meaningful discourse to the benefit of both. This will constitute an inherent benefit to the successful execution of the activities described above.

CART will enrich **career services and graduate school planning and preparation** by incorporating *Fundamentals of Engineering* exam review into the course offerings available through CART-CMS. In addition, the expansion ARAP will strengthen the role of industry throughout the College, develop substantive curriculum vitae based on the experience and thereby impact the efficiency of career placement services. The Vice President for Academic Affairs will coordinate with the program manager to develop a program for enrichment of these services that will lead to the seamless transition of thirty graduates per year by the end of the fifth year of funding.

Faculty Professional Development

CART will support **professional development workshops**; faculty members participating in the ARET online program will be provided with access to communication sites and software required by the curriculum. Initial training and updates will be provided either through travel to training centers or on-site workshops. Faculty will attend national conferences on engineering education, online service enhancements and program assessment themes.

Faculty members will disseminate information on the development, operation and success of the online program by conducting presentations at national, regional, and local conferences. The program will also develop a series of continuing education seminars, to introduce the online curriculum to mid-career professionals who want to complete a BS degree through the online program.

CART will increase **research opportunities for faculty** in both quantity and quality through funding of this effort due to the support of qualified applied research assistants and the teaching productivity enhancements supported by expanding our CART-CMS. The Director of Applied Research will work with program faculty to increasing funding generated from other research activities by fifty percent at the end of the third year of this project and one hundred by the close of year five.

5. Evaluation and Assessment Plan:

Formative project evaluation will be based on our drive to meet TAC of ABET accreditation requirements without compromise, and enhance our delivery of the program without simply creating a web-based novelty. Therefore, the requirements for successful delivery of our program will remain consistent with the TAC of ABET GENERAL CRITERIA for students and graduates as follows:

- A. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,
- B. and an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology,
- C. and an ability to conduct analyze and interpret experiments and apply experimental results to improve processes,
- D. and an ability to apply creativity in the design of systems, components or processes appropriate to program objectives,
- E. and an ability to function effectively on teams,
- F. and an ability to identify, analyze and solve technical problems,
- G. and an ability to communicate effectively,
- H. a recognition of the need for, and an ability to engage in lifelong learning,
- I. and ability to understand professional, ethical and social responsibilities,
- J. a respect for diversity and knowledge of contemporary professional, societal and global issues,
- K. And commitment to quality, timeliness, and continuous improvement.

The criteria established above will be used to screen activities and feedback deviations to continually improve the implementation of future funded research activities throughout the implementation period leading to an honest assessment of ARET program, CART-CMS, and CART-ARAP for meeting the requirements above.

An assessment plan for the project will be developed through the ARET Department and the BSC Assessment Office. The plan will include collection of data fields that apply to the institutional level and the engineering enrollment categories; enrollment, mobility, and graduation. As part of the ARET Department's continuing accreditation through TAC of ABET a self study and continuous improvement plan documents were published. These documents analyzed data collected over the past three years. Data categories from these studies and the SEIS contain substantial overlap in content. The self study also collected elements on the curriculum; student exit interviews, faculty interviews, and advisory board comments. The self study was used to provide feedback to the continuous improvement plan. This process has been in place since 1996 and will be adapted to form part of the content of the assessment plan for this project.

Advisory committees will be used to monitor the project progress and maintain the quality of the ARET online curriculum and course delivery systems. The IAC will report on the broader impacts of implementation, the project progress and budgetary compliance of the work, and the current assessment of academic performance enhancement. The EAC will report on implementation activities and report the findings of the internal review.

Our online ARET program requires an additional set of elements to be successfully implemented. The program will require a means of submitting additional materials in other formats including: drawings, presentations, group projects, and graphic examinations. Drawings will be submitted, marked up for modifications and corrections, and then posted for return. Presentations will be made to an online audience of faculty,

guest reviewers, and the other students in the class. The program will also need the ability to organize students into workgroups that allow them to cooperate in projects as well as working independently of other groups. Graphic examinations need to be administered utilizing an online CAD format, requiring a rudimentary CAD skill level while allowing students to solve multifaceted architectural problems. These elements combined to create a unique set of requirements for the online program. These features have yet to be developed within the CART-CMS suite. However, there are existing graphic testing and rudimentary CAD systems that hold promise for inclusion in our CART-CMS capabilities.

Graphic Material

TAC of ABET IIB program criteria for architectural engineering technology identify the need for the following abilities:

II.B.2.b. Technical Specialties.

II.B.2.b. (2). Baccalaureate degree curricula must include topics in architectural design; architectural graphics; architectural detailing; computer-aided drafting; contracts and specifications; construction materials and methods; building electrical/mechanical systems, elementary structures; materials testing; estimating; architectural theory; building environmental control systems; building codes; concrete, steel, and wood structures design; planning and scheduling; and site planning.

Drawings and other graphic materials make up a major portion of the course content assigned in four of the six required ARET courses in the BS degree curriculum. Drawings will need to be created in specific formats using standard nomenclature; titles, scales, uniform sets of symbols, and text appearance criteria. As part of the requirements of these courses, drawings will be submitted for periodic reviews. Projects submitted for these scheduled reviews will be marked-up for modifications, deletions, and corrections utilizing CAD techniques, Windows features or equivalent. Drawing files will be uploaded through the CART-CMS as .DX, .DWF or .DWG format files. Drawings sets will be reviewed by the faculty member and posted on the CART-CMS for return and feedback. Final drawings sets will be archived by the ARET Department and maintained as hard copy portfolio evidence on the CART-CMS server.

Presentations

TAC of ABET IIB program criteria for architectural engineering technology also identifies the need for the following abilities

Communications: The communications content must develop the ability of graduates to 2003-2004 Criteria for Accrediting Engineering Technology Programs – Technology Criteria 2000

- A. plan, organize, prepare, and deliver effective technical reports in written, oral, and other formats appropriate to the discipline and goals of the program,
- B. incorporate communications skills throughout the technical content of the program,
- C. utilizes the appropriate technical literature and use it as a principal means of staying current in their chosen technology

The ARET Online program will require students to compose presentations in the courses involving building design and planning. Presentations will become the tool used to describe the background, intent and solutions to design problems. Presentations will be delivered to a variety of reviewers: faculty members, guests from the AEC fields, and the other students in the course. The audience aspect provides some technological challenges. Presentations may be prepared using PowerPoint or other presentation software and presented in real time. Other formats, such as streaming video and web-cam broadcasts are possible; however the development and transmission software needs to be available to all students. New technology may soon emerge that provides better opportunities for completing this task.

Workgroups

TAC of ABET program criteria for architectural engineering technology identify the need for the following abilities:

Communications: The communications content must develop the ability of graduates to 2003-2004 Criteria for Accrediting Engineering Technology Programs – Technology Criteria 2000

- D. utilizes the interpersonal skills required to work effectively in teams.

Course work in the ARET Online program will involve projects assigned to student groups described above. Developing and maintaining teams in online format course will pose the most problematic set of challenges. Program courses will use existing CART-CMS “chat rooms” and forum technology and newly emerging conferencing software to allow collaboration between group members. Software features will establish communications parameters between members of individual groups, while providing security via password from viewing by other nonmember students.

Online graphic testing

The ARET Online program poses a situation that will require an innovative solution to the online testing challenge. The design courses in the program will require a series of real-time graphic examinations to measure skills and knowledge of course materials. The graphic exams will use a vignette format, solving limited scope design problems in a set amount of time. The graphic exams will be posted on the CART-CMS specific to ARET Online. Each student will generate a solution to the vignette utilizing an internal, limited scope CAD program. No additional software will be required. AutoDesk, Inc. and

Educational Testing Services (ETS) have devised such a CAD system and the program is working on acquiring a licensed version for use within our CMS. The exam solutions will be stored on site for retrieval and grading by the instructor. Graded exam results are then posted for student review.

6. Dissemination Plan

The ARET Department will devise a dissemination plan that will include a multifaceted approach. Faculty members and research assistants will conduct presentations at national education conferences to introduce the online curriculum and share experiences with other institutions considering an online approach. Presentations will also be prepared by ARAP students to overview their program to other local and regional institutions. A series of training seminars will be composed to introduce the ARET online curriculum to professional organizations to identify potential mid-professional students working in their firms.

Over the life of the project the Department will work to develop new partnerships with AS degree granting institutions to identify students graduating from their programs in architectural technology or related fields who desire to complete their BS degree. These partnerships will also foster the ability to create and share courses within the programs to provide additional electives and specializations.

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