The North Carolina Community College System
And
The University of North Carolina
Joint Report on
The NCCCS – UNC 2 + 2 E-Learning Initiative
(Session Law 2006-66, Section 9.1)

Submitted at the Request of
The North Carolina General Assembly

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Part I
North Carolina Community College System

NCCCS/UNC 2 + 2 E-Learning Initiative
2007-2008

Pursuant to Session Law 2006-66, An Act to modify the Current Operations and Capital Appropriation Act of 2005, section 9.1, and Session Law 2008-107, Section 9.7(c), the North Carolina Community College System Office and the University of North Carolina General Administration submit this report on the implementation of the North Carolina Community College System (NCCCS) – University of North Carolina (UNC) 2 + 2 E-Learning initiative (the Initiative).

Pursuant to Session Law 2008-107, Section 9.7(c), the University of North Carolina (UNC) and the North Carolina Community College System (NCCCS) shall report by September 1, 2008, and annually thereafter, to the Joint Legislative Education Oversight Commission, the State Board of Education, the Office of State Budget and Management, and the Fiscal Research Division of the General Assembly on the implementation of the UNC-NCCCS 2 + 2 E-Learning Initiative. This report includes:

1) The courses and programs within the 2+2 E-Learning Initiative;
2) The total number of prospective teachers that have taken or are taking part in this initiative to date broken down by the current academic period and each of the previous academic periods since the program's inception;
3) The total number of teachers currently in the State's classrooms, by local school administrative unit, who have taken part in this initiative;
4) The change in the number of teachers available to schools since the program's inception;
5) The qualitative data from students, teachers, local school administrative unit personnel, university personnel, and community college personnel as to the impact of this initiative on our State's teaching pool; and
6) An explanation of the expenditures and collaborative programs between the North Carolina Community College System and The University of North Carolina, including recommendations for improvement.

The North Carolina Community College System (NCCCS) is dedicated to providing high-quality, easily accessible educational opportunities that encourage and support student success. In keeping with these objectives, funds provided by the 2 + 2 E-Learning Initiative have provided additional resources to create and expand online courses and programs, professional development services, and acquisition and implementation of needed infrastructure.

Courses and Programs

1) The courses and programs within the 2+2 E-Learning Initiative

Teacher Education

One of the focal points for this initiative is to address the critical shortage of teachers in North Carolina. One way to address this shortage is to make the courses more accessible to students by creating online content for the community colleges through the Virtual Learning Community (VLC), which provides a collection of online courses to the 58 community colleges. By developing online courses for the pre-major degrees, we can provide access to students who might not otherwise have time to attend college in the traditional method of face to face instruction. The two systems (NCCCS and UNC) initially identified five pre-education programs under the North Carolina Comprehensive Articulation Agreement (CAA), whereby students may begin their education at a community college with an associate degree then transfer to a university to complete a bachelor's degree. During the first three years of the 2+2 Initiative, VLC centers were funded to develop selected courses for the following degrees.

Associate in Arts/Elementary Education (*online June 2008*)
Associate in Arts/Middle Grades Education and Special Education (*online June 2008*)
Associate in Science/Chemistry and Chemistry Education *(online June 2009)*
Associate in Science/Biology and Biology Education *(online June 2009)*
Associate in Science/Mathematics Education *(online June 2009)*

After reviewing the online courses required for transfer to the university system to complete an education degree, a target list of courses and programs was developed. This list has guided system-wide course development for the past three years. By combining 2 + 2 E-Learning Initiative funds and other state appropriations for distance learning into a focused course development plan, all five Associate degree programs were completed by June 2009. Students who earn these online associate degrees then transfer to a college or university to complete the last two years of their bachelor's degree in education. (*See Appendix C*) As the targeted online education degrees were completed, the focus of course and program development has expanded to address critical needs in North Carolina, including allied health and nursing, engineering, and workforce development areas.

In October 2008, the State Board of Community Colleges awarded a STEM (Science, Technology, Engineering, Math) Course Development Center in the amount of $150,000 per year from 2 + 2 Initiative funds for the 2008-2009 and 2009-2010 fiscal years. In 2008-2009, the STEM Center developed CHM 251 Organic Chemistry I, CHM 252 Organic Chemistry II, PHY 152 College Physics II, PHY 252 General Physics II, MAT 280 Linear Algebra, BIO 175

General Microbiology, and BIO 275 Microbiology and their respective lab components. Nine courses and their respective labs will be developed in 2009-2010, as shown in Figure 9 below.

Figure 9: STEM Course Development Center

Course Number	Course Name	Class-Lab-Credit
2008-2009 Courses		
CHM 251 *(completed)*	Organic Chemistry I	3-3-4
CHM 252 *(completed)*	Organic Chemistry II	3-3-4
PHY 152 *(completed)*	College Physics II	3-2-4
PHY 252 *(completed)*	General Physics II	3-3-4
MAT 280 *(completed)*	Linear Algebra	3-0-3
BIO 175 *(completed)*	General Microbiology	2-2-3
BIO 275 *(completed)*	Microbiology	3-3-4
2009-2010 Courses		
CSC 120	Computing Fundamentals I	3-2-4
DFT 170	Engineering Graphics	2-2-3
EGR 220	Engineering Statics	3-0-3
BIO 168	Anatomy & Physiology I	3-3-4
BIO 169	Anatomy & Physiology II	3-3-4
MAT 070	Introductory Algebra	3-2-4
MAT 080	Intermediate Algebra	3-2-4
MAT 090	Accelerated Algebra	3-2-4
CHM 090	Chemistry Concepts	4-0-4

*Note: Chemistry and biology labs will be developed using Late Nite Labs software.

The development of the 2008-2009 courses completed the following online degree programs: Associate in Science/Chemistry and Chemistry Education, Associate in Science/Biology and Biology Education, and the Associate in Science/Mathematics and Mathematics Education, as of June 2009. By completing the remaining courses, the Associate in Science/Engineering degree will be available online by June 2010. The developmental courses in Mathematics and Chemistry will help students prepare for college level Mathematics and Chemistry concepts, so that they may be successful in completing a degree in one of the STEM areas. Currently, sixty-five percent (65%) of high school students entering the community college system must take one or more developmental courses.

Including the online teacher education degrees, the VLC contains 33 completely online degrees, 248 curriculum courses, and 38 continuing education courses that may be used freely by any of the 58 community colleges in the system. *(See Appendices B and C)* The VLC courses developed in 2008-2010, contain learning objects to engage students and enhance learning of difficult concepts. The courses are developed in Blackboard version 7.3 and converted to Moodle 1.9, an alternative open source course management system.

Delivering online courses presents specific challenges in certain program areas such as science and mathematics. With the aim of addressing these particular challenges, research on content-specific pedagogy was commissioned to analyze programs or software which addresses specific barriers associated with offering math or science courses and their respective labs online. Resources from the 2+2 Initiative have been used to fund a variety of educational tools which foster student engagement, including the Math Pedagogy Project, Science Pedagogy Project,

Virtual Microscope, Late Nite Labs Online Chemistry Lab Simulations, Late Nite Labs Online Biology Lab Simulations, and SAS inSchool Curriculum Pathways.

LEARN NC was contracted to create resources for content-specific pedagogy in the online environment. These resources provide insight into the specifics of teaching a particular discipline in an online course. The initial project was for mathematics pedagogy and the project completed in November 2008 focuses on the development of science pedagogy. The resources are designed for current and future online math and science instructors at the post-secondary level and the results of the studies have been published to a website (http://www.nclearningonline.org/node/8).

With the help of 2 + 2 Initiative funds, the NCCCS was able to invest in online chemistry simulations developed by Late Night Labs. These laboratory simulations were included in the science courses that were developed by 2+2 Initiative funds in 2007-2008 and 2008-2009. In 2009, responding to the need for more online laboratory experiences, the NCCCS agreed to participate in a biology simulation pilot program with Late Nite Labs. Seven online science instructors from seven different colleges in the system are piloting newly developed biology simulations in BIO 111 and BIO 112 courses. Student and faculty assessments will be completed at the end of the Fall 2009 and Spring 2010 semesters. If the assessments are positive, the biology simulations will be offered to all colleges in the system for the Fall 2010 semester.

The purchase of a system-wide license for the Virtual Microscope software further enhanced students' online science experiences. The Virtual Microscope provides a cost effective way for students to experience state-of-the-art microscopy by viewing images created with research quality microscopes and camera systems. The Virtual Microscope mimics the physical functionality of a real microscope and requires students to follow traditional laboratory process and protocol. The high-resolution biological specimens imaged for the program lucidly illustrate fundamental biological principles. The program is web-deliverable and can also be downloaded to college computers in classrooms and PC labs. Online courses developed by funds from the 2+2 Initiative have included activities using Virtual Microscope, Late Nite Labs, and SAS inSchool Curriculum Pathways.

Quantitative Data Concerning Teachers

2) The total number of prospective teachers who have taken or are taking part in this initiative to date broken down by the current academic period and each of the previous academic periods since the program's inception;
3) The total number of teachers currently in the State's classrooms, by local school administrative unit, who have taken part in this initiative;
4) The change in the number of teachers available to schools since the program's inception;

NCCCS does not have access to some of the data concerning the impact of 2+2 Initiatives on the pool of public teachers. The total number of teachers currently in the State's classrooms, by local school administrative unit, who have taken part in this initiative, would need to be provided by the Department of Public Instruction (DPI) at a later date. The change in the number of teachers available to schools since the program's inception would also need to be provided by DPI.

Another limitation concerning data collection on education programs is the fact that NCCCS only offers the first two years of any education degree program. Degrees for public school teachers require a bachelor's degree and students are not tracked by NCCCS to the institution in which they complete the remaining two years of the degree. The initial courses developed by the 2+2 Initiative were first available in June 2008. Many students require more than two years to complete an associate degree and often more than four years to complete a bachelor's degree. If the student is part-time it may take a great deal longer. Therefore, data concerning the impact of 2+2 on the teacher pool will not be available for several years.

The total number of students, who have graduated from community colleges with an associate degree in an educational area since the initial 2+2 funds were received in 2005, is 4,938. Please note that the numbers for Summer 2009 graduates will not be available until September 18, 2009, and are not included in the charts below. The annual figures are represented in Figure 1 below. The number of prospective teachers that have taken or are taking part in education degree programs at the community colleges to date, broken down by the current academic period and each of the previous academic periods since the 2+2 program's inception, is represented in Figure 2. The total number of students enrolled in the teacher education articulation programs has increased by 24.5% from 2005 to 2009. Data for the fiscal year ending Summer 2009 will be available by September 18, 2009.

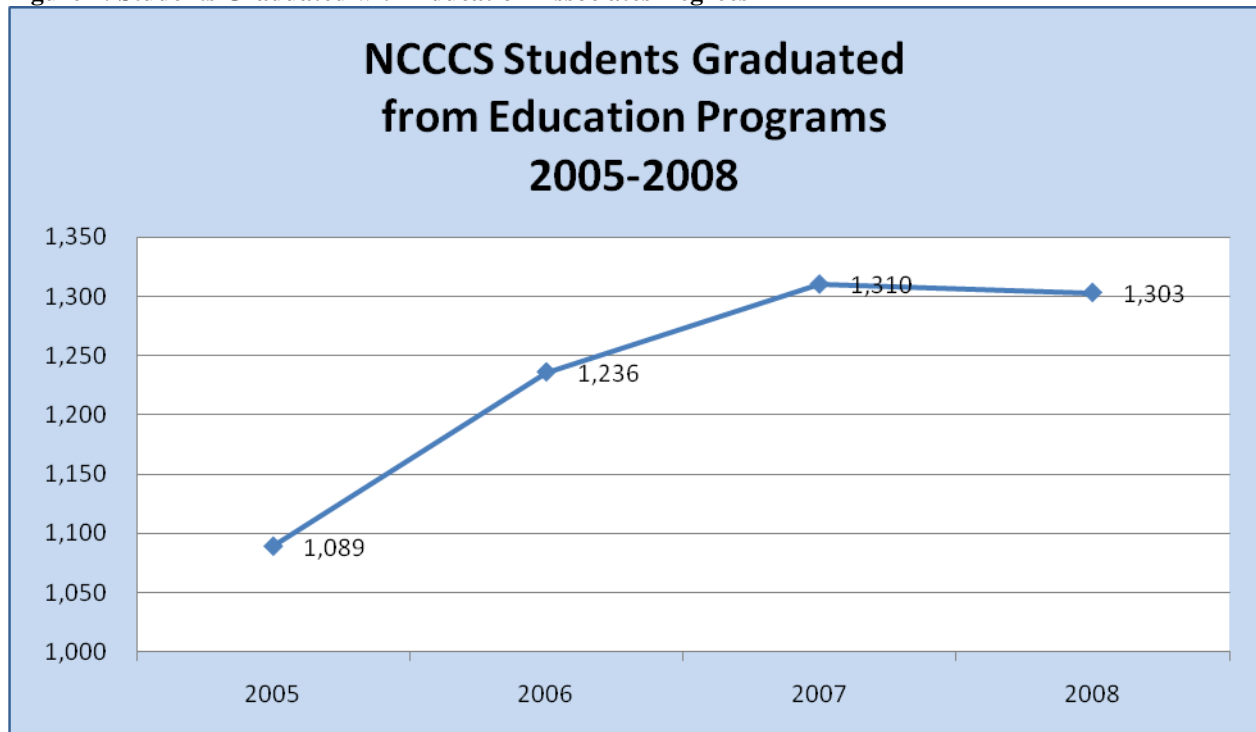**Figure 1: Students Graduated with Education Associates Degrees**

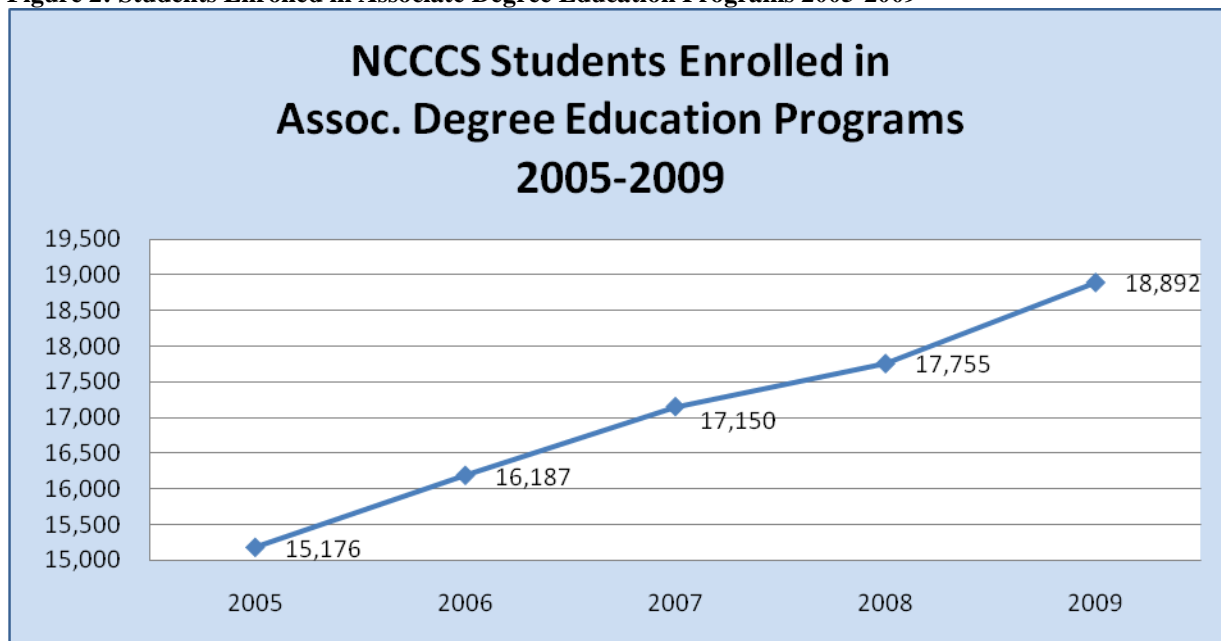**Figure 2: Students Enrolled in Associate Degree Education Programs 2005-2009**

NCCCS Students Enrolled in
Assoc. Degree Education Programs
2005-2009

2005	15,176
2006	16,187
2007	17,150
2008	17,755
2009	18,892

Qualitative Data Concerning Teachers

5) The qualitative data from students, teachers, local school administrative unit personnel, university personnel, and community college personnel as to the impact of this initiative on our State's teaching pool;

While qualitative data about the impact of 2+2 funds on the teacher education pool is not available, quantitative data is available with limitations as noted above. Yet another limitation to quantitative data collection is the fact that the student information system for NCCCS does not track the instructional delivery method of required courses in a program. Additionally, student transcripts do not indicate the delivery method of the credits earned. Quantitative data, however, on course enrollments for all distance education courses is tracked as shown in Figures 3 and 4, showing a significant increase in total online enrollments over several years.

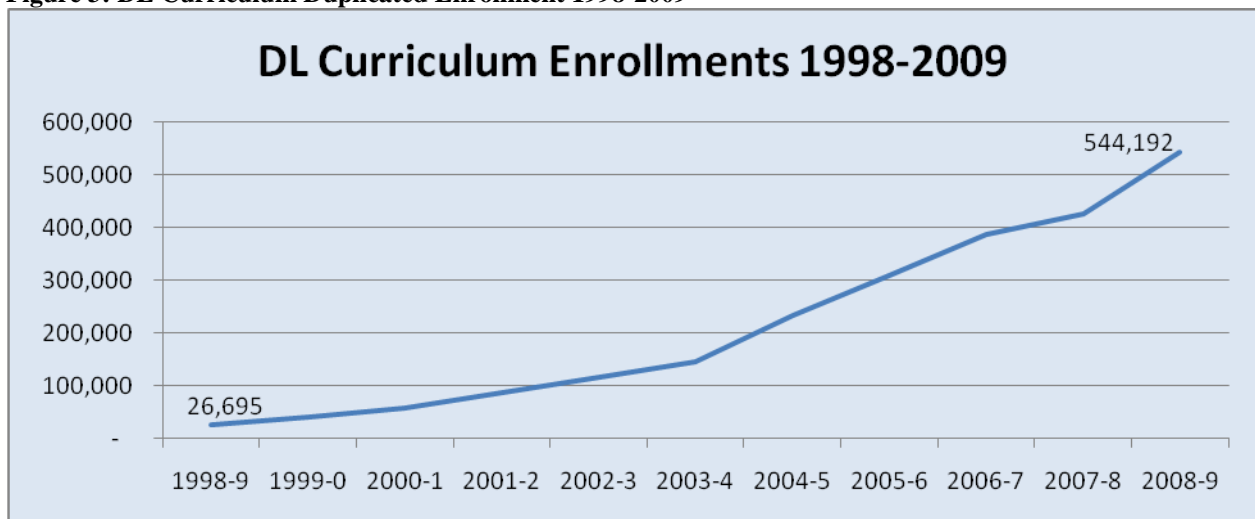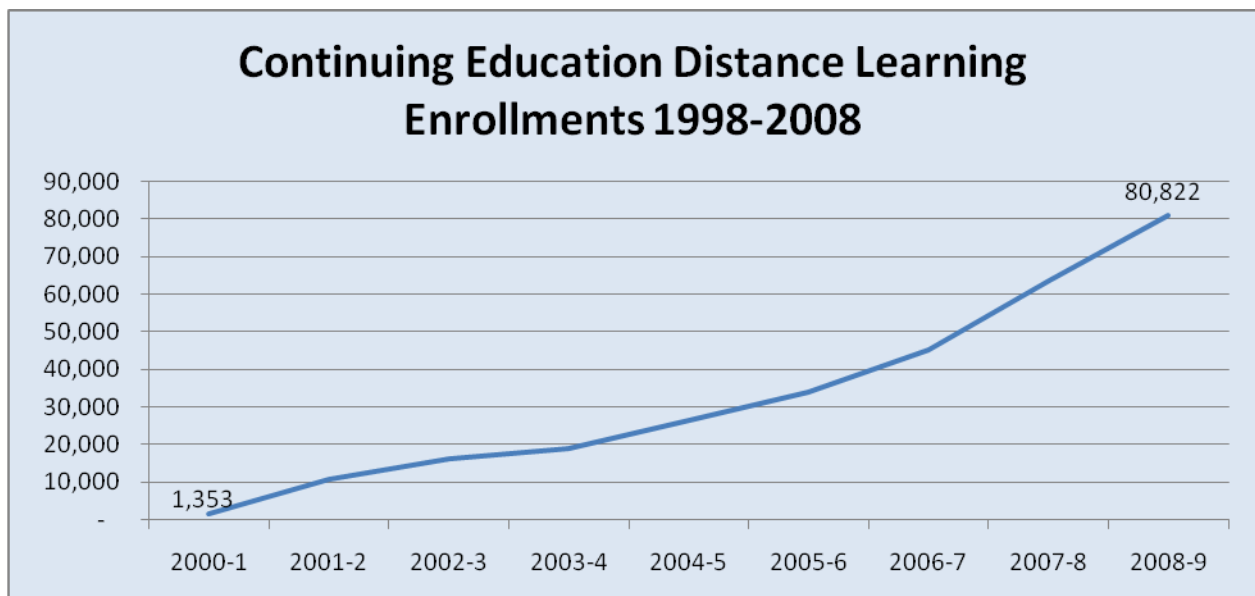**Figure 3: DL Curriculum Duplicated Enrollment 1998-2009**

Figure 4: DL Continuing Education Duplicated Enrollment 1998-2009 (no distance enrollments recorded before 2000)

Expenditures and Collaborative Programs

6) An explanation of the expenditures and collaborative programs between the North Carolina Community College System and The University of North Carolina, including recommendations for improvement.

The focus of the 2 + 2 Initiative funds for 2008-2009 was on delivery methods of the courses, course content, supplemental learning activities, and support for faculty. Initiatives were chosen that would have the greatest impact on distance education for the community college system. Expenditures from 2+2 Initiative funds include the projects listed in Figure 5. The explanations of the various projects are provided in Appendix A.

Figure 5: 2+2 Expenditures for Fiscal Year 2008-2009

TEACHER EDUCATION RESOURCES	2008-2009
STEM Course Development Center	$131,048.61
Late Nite Labs Chemistry	8,400.00
Late Nite Labs Biology	15,000.00
Virtual Microscope	12,500.00
SAS inSchool Curriculum Pathways	67,000.00
Science Pedagogy/LEARN NC	30,000
Category Expenditures 2008-2009	**$263,948.61**
*ADA Compliance/Editing Center (2009-2010)	~~150,000~~
*Assessment Tools (2009-2010)	~~10,000~~
*Virtual Microscope (2009-2010)	~~12,500~~
PROFESSIONAL DEVELOPMENT	
ADA Project	$50,000
LOR Training	8,000
Category Expenditures 2008-2009	**$58,000**
*LOR Training for College Faculty (2009-2010)	~~12,000~~
INFRASTRUCTURE	
NCLOR (ITS hosting, software licenses, training, travel, project management services)	$382,486.98
Elluminate	10,000
Bb Server and Software	21,304.21
Open Source Collaborative Moodle Assessment	74,440.00
LEARN NC CMS Hosting	25,700.00
Monterey Institute/NROC Learning Objects	12,500.00
Category Expenditures 2008-2009	**$526,431.19**
OTHER	
VisiCom (NCIH contract/software upgrade	$1,975.00
Category Expenditures 2008-2009	**$1,975.00**
Total Expenditures for 2008-2009	$850,354.80
*Budget Items Cancelled Due to Budget Cuts/Reversions	

Teacher Education

The course development center for 2008-2009 focused on science and mathematics courses. The center developed six courses and their respective labs, which are required in several of the education associates degree programs. These courses were made available to the community colleges in June 2009. Course developers from the community colleges, state universities, and private universities were used in the development of the science and mathematics courses.

The science pedagogy project brought together science specialists with previous experience in online teaching and learning. This project included university and community college faculty, as well as instructional designers from LEARN NC and NCCCS. In this pilot, a work group identified barriers to online science pedagogy, established a timeline for the development of resources, and reviewed the final product before presenting the resources. The science resource format is available in both the form of a web-based series of articles as well as printable .pdf files to facilitate off-line reading. The science project was completed in November 2008.

The success of the Late Nite Labs simulation software is substantiated by the increase in use by college faculty. The demand for Late Nite Labs online simulations increases steadily each year. Figure 6 shows that during the 2006-2007 academic year, 103 students used Late Nite Labs. During the 2007-2008 academic year, a total of 1,137 students used Late Nite Labs. From Fall Semester 2008 through the Summer Semester 2009, 1,384 students used Late Nite Labs in community college courses (See Appendix A). A total of 2,624 students have taken advantage of this online resource.

Figure 6: Student Use of Late Nite Labs 2007-2009

Student Use of Late Nite Labs	
Spring 07	50
Summer 07	53
Fall 07	491
Spring 08	585
Summer 08	61
Fall 08	662
Spring 09	526
Summer 09	196

Late Nite Labs are being used in the following chemistry courses: CHM 090, CHM 094, CHM 131, CHM 132, CHM 151 and CHM 152. Online courses for CHM 251 and CHM 252 were developed in 2008-2009 using Late Nite Labs simulations. The addition of the science courses with the accompanying labs has provided a missing link enabling students to complete online courses that require a lab component. Because of the success of the online chemistry labs, the NCCCS is taking part in an online biology lab simulation pilot with Late Nite Labs. Instructors and students from seven of the system's community colleges are using online simulations for BIO 111 and BIO 112. Late Nite Labs Online Biology Lab Simulations will be available for system-wide use by Fall 2010.

The Virtual Microscope software was distributed on compact disc to all 58 community colleges in Spring 2008. This resource is being used in science courses and other related fields of study. During the Spring 2009 Semester, this resource was placed in the North Carolina Learning

Object Repository (NCLOR) where it can be accessed from a website link removing the previously cumbersome wait time to download large files.

NCCCS completed a three-year contract for SAS inSchool Curriculum Pathways. Curriculum Pathways are high-end commercially prepared and copyrighted learning objects available to a wide array of community college students enrolled in science, math, history, English/literature, and Spanish courses. These learning objects allow faculty to enhance either online learning or face to face courses. In 2008, SAS announced they will provide inSchool Curriculum Pathways as a free resource to all school systems across the country.

Professional Development

In 2008-2009, funds from the 2 + 2 Initiative were used for professional development training workshops for 1) software used to create learning objects for the Learning Object Repository (LOR); 2) teaching faculty members how to use Elluminate webinar applications; 3) training faculty in creating online courses that meet the Americans with Disabilities Rehabilitation Act (ADA) compliance standards, and 4) teaching Blackboard administrators about network server maintenance and software applications.

NCLOR Software Training
Virtual Learning Community (VLC) course developers and college faculty participated in eight workshops over two days on software applications used for creating learning objects. A learning object is a self-contained, reusable, standalone unit or "chunk" of knowledge that is sequenced logically and provides student engagement and interaction. Learning objects are housed in a digital library called a learning object repository. Faculty can use learning objects in online, hybrid, and traditional face to face classes to enhance a lesson or convey a difficult concept. Workshop participants learned how to create interactive learning objects using Camtasia, Captivate, Softchalk, and Flash software applications. All VLC online courses developed in 2008-2009 contain interactive learning objects. To enhance the effectiveness of the software training workshops, the trainers conducted a pre-workshop Elluminate session to provide some prerequisite knowledge of the software and to ensure that all participants had the right version of software correctly installed on their laptop computers, enabling the participants to be able to create learning objects with one of the four software applications during the hands-on workshops. The trainers also conducted a post-workshop Elluminate session to provide help with editing or revising the learning objects created at the training workshops.

Americans with Disabilities Rehabilitation Act (ADA) Compliance Standards Training
Equally important to the development of interactive online courses is the critical area of accessibility in the online environment. Federal Section 508 of the Americans with Disabilities Rehabilitation Act (ADA) governs web and course development accessibility requirements for community colleges in North Carolina. The law requires electronic and information technology products developed and/or maintained by an agency to be fully accessible to people with disabilities.

Professional development training on ADA compliance provided online course conversion training to 30 people regarding the regulations in Section 508 of the Americans with Disabilities Rehabilitation Act (ADA) standards for online courses. The workshops provided each participant with the skills necessary to modify one existing Virtual Learning Community (VLC) course to meet ADA standards and to update the course to the 2008 VLC template. This training

made it possible for the 30 participants to then go back to their colleges and train others about ADA compliance, as well as to update local online courses to meet ADA standards.

Blackboard Server, Software, and Training
In June 2009, the contract with LEARN NC expired. This contract provided for hosting services and technical support for the VLC course development centers. The North Carolina Community College System Office staff began preparing for transition to a new hosting arrangement in February 2009. A team of eight System Office staff members met weekly to determine the plan of action, created a project timeline, signed a memorandum of understanding, and were able to complete the project several days before the deadline. With a portion of the 2+2 Initiative Funds, NCCCS was able to invest in hardware and software for the VLC, which saves future hosting costs of more than $25,000 per year. The team was able to negotiate free training from Blackboard, which saved the system approximately $3500. Seven system office staff members were trained on Blackboard application administration and server administration over a two-day period. The team purchased a Hewlett Packard server and Windows Server 2008 software capable of virtualizing the Blackboard instance for VLC course development. The system migrated to Windows 2008, SQL 2005, and upgraded from Blackboard version 7.2 to 7.3. This operation was very successful and is a model for future IT project plans at NCCCS.

Infrastructure

NCLOR
The North Carolina Learning Object Repository (NCLOR) was initially designed as a system-wide repository providing the capacity to catalogue, store, search, access, and utilize digitized learning/teaching content. Learning objects are generally defined as (1) digital content assets in the form of files or collections of files that typically have a wide-range of learning/teaching applications and (2) self-contained comprehensive learning modules that address selected learning competencies in a specific course or program. Learning objects are sharable, reusable, standards based and accessible by the vast majority of learning applications. The NCLOR complies with SCORM standards [*Sharable Content Object Reference Model (SCORM) is a collection of standards and specifications for web-based e-learning, which provides compatibility with several different types of course delivery systems.*]; is scalable to serve the entire PreK-20 educational community; and has a contract provision to include all NC public educational entities in an aggregate enrollment license formula. The NCLOR can be accessed at http://www.explorethelor.org/.

Creation of the state-wide NCLOR is recommendation #9 of the NC e-Learning Commission approved by the NC Education Cabinet and the State Board of Education in January 2005. The NCLOR currently in production is supported by NCCCS 2+2 funding. Development of the NCLOR has taken place over the last 3.5 years, an intensive collaboration of a Steering Committee composed of administrators, faculty, and support specialists from NCCCS and UNC central offices and institutions. Volunteers from the NC Department of Public Instruction, NC Virtual Public School, and the NC Association of Independent Colleges and Universities have also participated.

Elluminate Collaboration Software

Elluminate is a webinar/collaboration tool effective for real time desktop sharing applications supporting help desk services and working groups. It can be used in tandem with conference calls or for voice and video capabilities to provide effective communications with reduced long distance costs.

Open Source Collaborative Moodle Assessment

Moodle open source course management system (CMS) has been found to be a viable alternative to Blackboard; the proprietary CMS used by the majority of North Carolina Community College System institutions. The assessment strategy was implemented by a team of NCCCS staff using three unique research methods, which independently verified the findings. The assessment team utilized functionality comparisons, end-of-term surveys (by both instructors and students) and case studies of four NCCCS institutions that had migrated from Blackboard to Moodle. The assessment findings verified that Blackboard and Moodle have similar overall application functionality. The faculty and students seem equally satisfied with either CMSs ease of use. The case studies indicated that migration from Blackboard to Moodle is challenging and resource intensive at the college level, but the colleges were uniformly satisfied with the results of the migration and reported a substantial reduction in overall costs once the migration was completed. Of significant note is that the study discovered a lack of "instructor comfort" with both CMSs, indicating that more effective instructor training is needed. The study, however, did not fully address the issues of technology and funding framed in terms of scalability, compatibility, and interoperability of all learning technology applications used in the NCCCS. The team reported its findings to the State Board of Community Colleges Finance Committee and recommended a determination of the technical and financial solutions required for the next stage of CMS utilization within the North Carolina Community College System.

LEARN NC

A partnership between NCCCS and LEARN NC was established to provide hosting services for the Virtual Learning Community's Blackboard instance. That contract expired in June 2009, and NCCCS purchased a server and software to provide the hosting services for the VLC to develop online courses.

Note: Descriptions, audience to be served, costs, and status reports of all 2+2 e-learning infrastructure components are found in Appendix A

Recommendations

While the NCCCS has made progress in achieving the goals and objectives of the 2+2 Initiative, the system has recommendations for future achievements necessary to meet critical needs for distance education.

It is recommended that:
- The math and science pedagogy projects be published as resources to the NC-NET website as well as the VLC/NCLOR to provide guidance to online instructors in these specific program areas.
- Additional PIN numbers be purchased for Late Nite Labs software due to the increased usage of the software.

- NCCCS participate in a pilot development project for microbiology labs using Late Nite Labs.
- NCCCS continue to research online software for system-wide use and pedagogically sound teaching principles for online courses.
- As education programs are completed as fully online degree programs, other areas of critical needs should be addressed such as nursing, engineering, and technology by funding a STEM course development center for the VLC.
- Additional collections/ebooks should be purchased for the NCLOR
- A VLC editing center should be established to ensure that all VLC courses are ADA compliant

NCCCS has met many of the goals of the 2+2 Initiative, as they address the critical need for teachers in our state. Our future objectives are to continue to expand courses and resources to support online teaching degrees, as well as to expand the scope to include allied health, nursing, and engineering as the next focal points for these funds.

<p align="center">**Appendices**</p>

Appendix A

<p align="center">**2008-2009 Expenditures for 2+2 Initiative**</p>

Student, Teaching, and Learning Resources Implemented by the NCCCS

Educational Resource: STEM (Science, Technology, Engineering, Math) Course Development Center

Description: The State Board of Community Colleges awarded Wake Technical Community College $150,000 to develop the following online STEM courses: CHM 251 Organic Chemistry I, CHM 252 Organic Chemistry II, PHY 152 College Physics II, PHY 252 General Physics II, MAT 280 Linear Algebra, BIO 175 General Microbiology, and BIO 275 Microbiology and their respective lab components.

Audience: Faculty and students of NCCCS

Cost: $131,048.61

Status: Completed all courses for 2008-2009. **Savings: $18,951.39** This center will develop nine new courses and their respective lab components for 2009-2010.

Educational Resource: Late Nite Labs - Online Chemistry/Biology Lab Simulations

Description: Late Nite Labs Chemistry - Late Nite Labs offers chemistry simulations that provide instructors with the capability to develop and customize high quality online chemistry laboratory simulations. This software allows students to complete labs anytime, anywhere.

Description: Late Nite Labs Biology Simulation Pilot - Late Nite Labs developed biology simulation software for Biology 111 and Biology 112 in collaboration with seven instructors from seven colleges in the North Carolina Community College System. The software enables students to complete laboratory simulations for courses delivered in online, hybrid, and traditional classroom settings. This software enables students to complete required biology courses necessary for completion of online teacher education degrees.

Audience: Students and faculty of NCCCS

Cost: $15,000 perpetual license for 300 biology student licenses
        $8,400 annual renewal for 1200 chemistry student licenses

Status: Use of Late Nite Labs continues to increase. At the conclusion of the biology pilot, online biology simulations will be made available to all instructors in the system. The expectation is that demand for biology student PINS will exceed chemistry PINS based on the number of students currently taking online biology courses.

Educational Resource: Science Learning Resources, Inc. - Virtual Microscope

Description: The Virtual Microscope provides a cost effective way for students to experience state-of-the-art microscopy by viewing images created with research quality microscopes and camera systems. The Virtual Microscope mimics physical functionality of a real microscope and requires students to follow traditional laboratory process and protocol. The high resolution prepared biological specimens imaged for the program lucidly illustrate fundamental biological principles. The program is both web-deliverable and can be downloaded to college computers in classrooms and PC labs.

Audience: NCCCS faculty and students

Cost: $12,500 for maintenance fees and annual license renewal.

Status: Software was distributed to all 58 colleges for installation on their servers. The Virtual Microscope can also be accessed through the North Carolina Learning Object Repository (NCLOR).   This resource is being used in science courses and other related fields of study.

Educational Resource: SAS inSchool Curriculum Pathways - Higher Education Learning Objects

Description: Curriculum Pathways are high-end commercially prepared and copyrighted learning objects available to a wide array of community college students in areas of science, math, history, English/literature, and Spanish. These resources are available with a minimum of training enabling faculty to enhance online, hybrid, and face to face courses.

Audience: Students and faculty of NCCCS

Cost: $67,000 annual renewal

Status: NCCCS is now in the third year of a three-year contract. Over 300 interactive learning objects will be housed in the NCLOR. *(In 2008, SAS announced they will provide inSchool Curriculum Pathways as a free resource to all school systems across the country.)* **Savings**: $67,000

Educational Resource: Science Pedagogy Project – Collaboration between NCCCS and LEARN NC

Description: LEARN NC was contracted to develop resources for content-specific pedagogy in the online environment. The project focus was science pedagogy. This project provided a model for the development of future content-specific resource development. Resources were designed for current and future online science instructors at the post –secondary level.

Audience: Faculty of NCCCS and UNC

Cost: $30,000

Status: Project was completed in November 2008.

Educational Resource: Americans with Disabilities Rehabilitation Act (ADA) Compliance Standards Contract

Description: Federal Section 508 of the Americans with Disabilities Rehabilitation Act (ADA) governs web and course development accessibility requirements for community colleges in North Carolina. The law requires electronic and information technology products developed and/or maintained by an agency to be fully accessible to people with disabilities. It is just as important to have a cadre of fully trained personnel in order to ensure newly-developed courses are compliant with the law.

This contract, administered by Surry Community College, provided online course conversion training to 30 people regarding the regulations in Section 508 of the Americans with Disabilities Rehabilitation Act (ADA) standards for online courses. The workshops provided each participant with the skills necessary to modify one existing Virtual Learning Community (VLC) course to meet ADA standards and to update the course to the 2008 VLC template, as well as the ability to go back to their respective colleges to train local faculty to update courses to ADA standards.

Audience: NCCCS faculty and students

Cost: $50,000 (one time cost)

Status: The edited courses were completed May 2009.

Educational Resource: Learning Object Repository Training

Description: Two-day training of software applications used in creating learning objects for Virtual Learning Community (VLC) Development Center staff, and college distance learning faculty and staff. The software applications included Camtasia, Softchalk, Captivate, and Flash.

Cost: $8,000.00

Status: Completed

Educational Resource: North Carolina Learning Object Repository Resources for NCCCS - The Learning Edge (vendor), Hosted by ITS, NCCCS LOR Hardware

Description: Learning Object Repository technology provides a "library" of digitized learning content termed learning objects in which these objects can be catalogued, searched, shared, and modified. Learning Object Repository technology promotes sharing of high quality resources and drastically reduces costs of duplication. The 2+2 funds have been used to establish the North Carolina Learning Object Repository. University and community college faculty, administrators, and support staff collaborated in all phases of planning, Request for Proposal

development, evaluation of vendor proposals, implementation, and expansion of the North Carolina Learning Object Repository. The project includes 2+2 funds to be directed for appropriate project management services required to satisfy Senate Bill 991 documentation and protocol; and contract services to assure that all testing components of the vendor Request for Proposal and contract development are properly completed and documented.

Audience: Faculty and students of NCCCS and UNC

Cost: $301,090.86   software license, travel and training
       29,343.40   hosting and servers
      52,052.72   ITS project management
    $382,486.98

 Status: The North Carolina Learning Object Repository (NCLOR) is in production and providing services to community colleges and universities. A full-time NCLOR Director was hired in July 2008, and a second support position was filled in January 2009.

In July 2008, the State Board of Community Colleges approved second year contracts with (1) The Learning Edge (vendor) to provide Equella software and professional services and (2) the State Information Technology Service (ITS) to provide hosting and project management services.

Educational Resource*: Elluminate Collaboration Software

Description: Elluminate is a web-based collaboration tool that is effective for real time desktop sharing applications. It can be used in tandem with conference calls or for voice and video capabilities to provide effective communications with reduced long distance costs. Collaboration is important to meet the needs of students and faculty from diverse communities and programs. Elluminate is used for professional development by faculty of NCCCS.

Audience: Used for professional development for faculty and staff of NCCCS and to support Virtual Learning Community development centers

Cost: $10,000

Status: The NCCCS currently contracts with Information Technology Services (ITS) for 65 Elluminate "seats." Costs for 2008-2009 have been shared in a collaborative agreement with ITS with each partner paying $10,000.

Educational Resource: Virtual Learning Community (VLC) Blackboard Server and Software

Description: Purchase by the North Carolina Community College System Office of a dedicated server and installation of software to house the Virtual Learning Community (VLC) Blackboard courses and for use by course development centers. The VLC courses are available to be previewed and downloaded to North Carolina community college servers.

Cost: $14,022.00   Hewlett Packard ProLiant DL580 G5 Server (one time cost)

$7,282.21 Software components required to build Blackboard development environment

Savings: $25,700 Annual hosting cost paid to LEARN NC
$3,500 Blackboard Administrators and Network Operators Training provided at no cost by Blackboard, Inc.

Status: Installation and training are completed and all server applications are proceeding as scheduled.

Educational Resource: Open Source Collaborative: Moodle Assessment

Description: Moodle open source course management system has been adopted by several NCCCS institutions. An open source system allows for the use of the most effective course designs without the limits of a proprietary system. Success of the North Carolina Moodle Users Group and the interest of several UNC institutions prompted creation of the joint NCCCS/UNC Open Source Collaborative: Moodle Assessment. This pilot project consolidated the efforts of NCCCS and UNC institutions as they explored the options of less expensive and open source course management system solutions. The NCCCS staff contracted with UNC General Administration to establish a central facility at which collaboration and experimentation could take place to assess Moodle as an online learning platform, establish high quality faculty training and migration tools, and explore centralized, turn-key solutions for the higher education community in North Carolina.

Audience: Faculty and students of NCCCS and UNC

Cost: $74,440

Status: The State Board of Community Colleges approved the Open Source Collaborative. NCCCS has contracted with UNC to provide system administration, training, migration tools, hosting services, and Datatel/Moodle dynamic compatibility. The pilot program was completed in May 2009. *(An extensive report was presented to the State Board of Community Colleges on August 21, 2009, showing Moodle as a comparable alternative to the proprietary Blackboard course management system. See Appendix D for Executive Summary)*

Educational Resource: UNC Chapel Hill Course Management System Software Support (LEARN NC)

Description: LEARN NC, a program of the UNC-Chapel Hill School of Education, hosted Blackboard course management system software for the NCCCS Virtual Learning Community until June 30, 2009. Service included hardware, backups, upgrades, and maintenance. The Blackboard license was paid by NCCCS.

Audience: Faculty and students of NCCCS

Cost: $25,700 annual renewal

Status: LEARN NC ended its contract with NCCCS on June 30, 2009. A dedicated server was purchased by NCCCS to house VLC Blackboard courses. **Savings:** $25,700 per year in hosting costs.

Educational Resource: Monterey Institute/NROC Learning Objects

Description: NCCCS licensed a collection of 3,682 interactive learning objects available to all faculty, staff, and students to enhance online, hybrid, and face to face course content.

Cost: $12,500.00

Status: Addition of 3,682 learning objects housed in the NCLOR

Educational Resource: VisiCom Software for NCIH Room

Description: Maintenance contract and software upgrade for video conferencing in System Office NCIH room. Included in this contract is technical support, software upgrades, and updates.

Cost: $1,975.00

Status: Installation completed

Appendix B

Degrees Available from the NCCCS
Virtual Learning Community (VLC)

There are currently 248 courses in the VLC Library with which colleges in the NCCCS could build programs of study to offer 33 online degrees. Those degrees include:

1. **AA/Associate in Arts (A1010A)**
2. **AA/Business Administration, Accounting, Economics, Finance, & Marketing (A1010B)**
3. **AA/Business Education and Marketing Education (A1010C)**
4. **AA/Criminal Justice (A1010D)**
5. **AA/English (A1010E)**
6. **AA/English Education (A1010F)**
7. **AA/History (A1010H)**
8. **AA/Nursing (A1010I)**
9. **AA/Political Science (A1010K)**
10. **AA/Psychology (A1010L)**
11. **AA/Social Science Secondary Education (1010M)**
12. **AA/Sociology (A1010N)**
13. **AA/Communication (A1010O)**
14. **AA/Social Work (A1010Q)**
15. **AA/Elementary Education (A1010R)**
16. **AA/Special Education (A1010S)**
17. **AA/Liberal Arts (A1010U)**
18. **AA/Information Systems (1010V)**
19. **AA/Middle Grades Education (A1011A)**

20. AA/General Education (A1030O)
21. AS/Biology/Biology Education (A1040A)
22. AS/ Chemistry/Chemistry Education (A1040B)
23. AS/Mathematics (A1040E)
24. AS/Mathematics Education (A1040F)
25. AS/Associate in Science (A1040O)
26. AAS/Accounting (A25100)
27. AAS/Business Administration (A25120)
28. AAS/ Business Administration/Human Resources Management (A2512C)
29. AAS/Business Administration/Marketing and Retailing (A2512F)
30. AAS/ Office Systems Technology (A25360)
31. AAS/Paralegal Technology (A25380)
32. AAS/Criminal Justice Technology (A55180)
33. AAS/Early Childhood Education (A55220)

Appendix C

Courses Available from the NCCCS
Virtual Learning Community (VLC)

248 Curriculum Courses
 38 Continuing Education Courses

Course #	Course Name
Curriculum Courses	
	Curriculum Courses
ACA 090	Study Skills
ACA 111	College Student Success
ACA 112	Intro. to Distance Learning
ACC 115	College Accounting
ACC 120	Principles of Financial Accounting
ACC 121	Principles of Managerial Accounting
ACC 129	Individual Income Taxes
ACC 130	Business Income Taxes
ACC 140	Payroll Accounting
ACC 150	Accounting Software Applications
ACC 220	Intermediate Accounting I
ACC 225	Cost Accounting
ANT 210	General Anthropology
ART 111	Art Appreciation
ART 114	Art History Survey I
ART 115	Art History Survey II
BIO 111	General Biology I
BIO 112	General Biology II
BIO 120	Introductory Botany
BIO 130	Introductory Zoology
BIO 140	Environmental Biology
BIO 145	Ecology
BIO 165	Anatomy & Physiology I
BIO 166	Anatomy & Physiology II
BIO 175	General Microbiology
BIO 275	Microbiology
BPM 110	Bioprocess Practices
BPR 111	Blueprint Reading
BUS 110	Introduction to Business
BUS 115	Business Law I
BUS 116	Business Law II
BUS 121	Business Math
BUS 135	Principles of Supervision
BUS 137	Principles of Management
BUS 153	Human Resource Management
BUS 217	Employment Law and Regulations

BUS 225	Business Finance
BUS 230	Small Business Management
BUS 234	Training and Development
BUS 238	Integrated Management
BUS 239	Business Applications Seminar
BUS 252	Labor Relations
BUS 256	Recruitment Selection & Personnel Planning
BUS 258	Compensation and Benefits
BUS 259	HRM Applications
BUS 260	Business Communications
CHM 131	Introduction to Chemistry
CHM 131A	Introduction to Chemistry Lab
CHM 132	Organic & Biochemistry
CHM 135	Survey of Chemistry I
CHM 135A	Survey of Chemistry I Lab
CHM 151	General Chemistry I
CHM 152	General Chemistry II
CHM 251	Organic Chemistry I
CHM 252	Organic Chemistry II
CIS 070	Fundamentals of Computing
CIS 110	Introduction to Computers
CIS 111	Basic PC Literacy
CIS 113	Computer Basics
CIS 115	Introduction to Programming & Logic
CIS 165	Desktop Publishing I
CIS 215	Hardware Installation and Maintenance
CIS 246	Operating Systems - Unix
CIS 286	Systems Analysis and Design
CJC 111	Introduction to Criminal Justice
CJC 112	Criminology
CJC 113	Juvenile Justice
CJC 121	Law Enforcement Operations
CJC 131	Criminal Law
CJC 132	Court Procedure & Evidence
CJC 141	Corrections
CJC 212	Ethics & Community Relations
CJC 221	Investigative Principles
CJC 231	Constitutional Law
COE 111	Co-op Work Experience I
COM 110	Introduction to Communication
COM 120	Interpersonal Communication
COM 130	Nonverbal Communication
COM 231	Public Speaking
CSC 134 &134B	C++ Programming
CSC 139	Visual Basic Programming
CSC 151	JAVA Programming
CSC 160	Introduction to Internet Programming
CSC 234	Advanced C++ Programming
CSC 239	Advanced Visual Basic Programming
CTS 125	Presentation Graphics
CTS 130	Spreadsheet
CTS 220	Advanced Hardware/Software Support
CTS 230	Advanced Spreadsheet
DBA 110	Database Concepts
DBA 115	Database Applications
ECM 168	Electronic Business

ECM 210	Introduction to Electronic Commerce
ECM 220	E-Commerce Planning & Implementation
ECO 151	Survey of Economics
ECO 251	Principles of Microeconomics
ECO 252	Principles of Macroeconomics
EDU 118	Teacher Assoc. Principles and Practice
EDU 119	Introduction Early Child Education
EDU 131	Child, Family, and Community
EDU 144	Child Development I
EDU 145	Child Development II
EDU 146	Child Guidance
EDU 151	Creative Activities
EDU 153	Health, Safety, & Nutrition
EDU 186	Reading & Writing Methods
EDU 216	Foundations of Education
EDU 221	Children with Exceptionalities
EDU 222	Learners with Behavior Disorders (formerly EDU 147)
EDU 223	Specific Learning Disabilities (formerly EDU 148)
EDU 235	School Age Development & Program
EDU 247	Sensory and Physical Disabilities
EDU 248	Developmental Delays
EDU 261	Early Childhood Administration I
EDU 262	Early Childhood Administration II
EDU 271	Education Technology
EDU 275	Effective Teacher Training
EDU 280	Language & Literacy Experiences
EDU 285	Internship Experience – School Age
EGR 110	Introduction to Engineering Technology
ELC 128	Introduction to PLC
ELN 133	Digital Electronics
EMS 235	EMS Management
ENG 070	Basic Language Skills
ENG 080	Writing Foundations
ENG 111	Expository Writing
ENG 112	Argument Based Research
ENG 113	Literature Based Research
ENG 114	Professional Research & Reporting
ENG 131	Introduction to Literature
ENG 231	American Literature I
ENG 232	American Literature II
ENG 233	Major American Writers
ENG 241	British Literature I
ENG 242	British Literature II
ENG 251	Western World Literature I
ENG 261	World Literature I
ENG 262	World Literature II
ENG 273	African-American Literature
FIP 120	Intro to Fire Protection
FIP 124	Fire Prevention & Public Education
FIP 128	Detection & Investigation
FIP 132	Building Construction
FIP 152	Fire Protection Law
FIP 220	Fire Fighting Strategies
GEO 111	World Regional Geography
HEA 110	Personal Health & Wellness
HIS 112	World Civilizations II

HIS 121	Western Civilization I
HIS 122	Western Civilization II
HIS 131	American History I
HIS 132	American History II
HIS 222	African-American History I
HIS 223	African-American History II
HIT 112	Health Law & Ethics
HOR 160	Plant Materials I
HSE 110	Introduction to Human Services
HSE 210	Human Services Issues
HUM 110	Technology & Society
HUM 115	Critical Thinking
HUM 122	Southern Culture
HUM 150	American Women's Studies
HUM 160	Introduction to Film
INT 110	International Business
ISC 110	Workplace Safety
ISC 112	Industrial Safety
ITN 150	Internet Protocols
ITN 250	Implementing Internet Services
LEX 110	Introduction to Paralegal Study
LEX 120	Legal Research/Writing I
LEX 130	Civil Injuries
LEX 140	Civil Litigation I
LEX 150	Commercial Law I
LEX 210	Real Property I
LEX 240	Family Law
LEX 250	Wills, Estates, & Trusts
LOG 110	Introduction to Logistics
MAT 050	Basic Math Skills
MAT 060	Essential Mathematics
MAT 070	Introductory Algebra
MAT 115	Mathematical Models
MAT 140	Survey of Mathematics
MAT 151	Statistics I
MAT 161	College Algebra
MAT 175	Precalculus
MAT 175A	Precalculus Lab
MAT 271	Calculus I
MAT 272	Calculus II
MAT 273	Calculus III
MAT 280	Linear Algebra
MAT 285	Differential Equations
MEC 180	Engineering Materials
MED 118	Medical Law & Ethics
MED 121	Medical Terminology I
MED 122	Medical Terminology II
MKT 120	Principles of Marketing
MKT 122	Visual Merchandising
MKT 123	Fundamentals of Selling
MKT 220	Advertising & Sales Promotion
MKT 221	Consumer Behavior
MKT 223	Customer Satisfaction (OMT154)
MKT 225	Marketing Research
MKT 226	Retail Applications
MKT 230	Public Relations

MNT 111	Maintenance Practices
MUS 110	Music Appreciation
NET 110	Networking Concepts
NOS 110	Operating System Concepts
NOS 230	Windows Administrator I
NUT 110	Nutrition
OMT 154	Customer Satisfaction
OST 122	Office Computations
OST 134	Text Entry & Formatting
OST 136	Word Processing
OST 137	Office Software Applications
OST 138	Advanced Software Applications
OST 148	Medical Coding, Billing and Insurance
OST 149	Medical Legal Issues
OST 164	Text Editing Applications
OST 184	Records Management
OST 236	Advanced Word/Information Processing
OST 289	Office Systems Management
PHI 210	Heart of Philosophy
PHI 240	Introduction to Ethics
PHY 110	Conceptual Physics
PHY 151	College Physics I
PHY 152	College Physics II
PHY 251	General Physics I
PHY 252	General Physics II
POL 120	American Government
PSY 150	General Psychology
PSY 241	Developmental Psychology
PSY 281	Abnormal Psychology
PTC 110	Industrial Environment
REL 110	World Religions
SEC 110	Security Concepts
SEC 150	Secure Communications
SEC 160	Secure Administration I
SOC 210	Introduction to Sociology
SOC 213	Sociology of the Family
SOC 220	Social Problems
SOC 225	Social Diversity
SPA 111	Elementary Spanish I
WEB 110	Internet/Web Fundamentals
WEB 115	Web Markup and Scripting
WEB 140	Web Development Tools
WEB 210	Web Design
WEB 230	Implementing Web Service
Continuing Education Courses	*Continuing Education Courses*
ANS 3011	Veterinary Assisting
CJC 3100	Law Enforcement: Explosives, Dirty Bombs, & Radiation Response
CJC 3100	Law Enforcement: Weapons of Mass Destruction
CJC 3100	Legal Aspects of Bioterrorism for Law Enforcement
COM 3729	Business Writing Skills
EDU 3000	Lateral Entry – Orientation

EDU 3002	Effective Teacher Training
EGY 3000	Renewable Energy
EMS 3044	Emergency Medical Technician Basic Initial
EMS 3200	Biological Agents of Bioterrorism
EMS 3200	Bioterrorism Awareness for EMS
EMS 3200	Chemical Agents of Bioterrorism
EMS 3200	Decontamination & Transport of Exposed Patients
EMS 3200	Radiological Emergencies for EMS
FIP 3610	Introduction to Fire Pumps
FIP 4728	Introduction to Bioterrorism for Firefighters
FIP 5512	R.T. Hazmat Awareness & Terrorism
FLI 3717	Conversational Spanish for Healthcare Workers
HAZ 3061	Hazardous Materials: Awareness
HEA 3002	Anatomy and Physiology
HEA 3014	Fund. Skills for Substance Abuse Counselors–Core Functions
HEA 3014	Fund. Skills for Substance Abuse Counselors – Ethics
HOS 3060	Meetings and Convention Planning Introduction
HRD 3001	Employability Skills
HSE 3264	Activity Director – Basic
MED 3023	Medical Coding
MED 3025	Medical Billing
MED 3030	Healthcare Billing & Coding
MHT 3100	Mental Health/ Developmental Disabilities Worker
MKT 3438	Customer Service
MLA 3022	Phlebotomy Education and Clinical Experience
MLS 3808	Leadership
NUR 3235	Medical Terminology
NUR 3236	Medical Transcription
NUR 3240	Nurse Aide Level I
NUR 3241	Nurse Aide Level II
OSH 3300	Bloodborne Pathogens Training
PHM 3250	Pharmacy Technician Training
Professional Development Courses	*Professional Development Courses*
OCT	Online Course Template (for development of 'VLC Certified Courses')
OCT 2	Online Course Template (for the development of online courses by an individual instructor for their personal use-not 'VLC Certified Courses')
PTOI	Principles and Techniques of Online Instruction

VLC courses are available for download and use on our website at
http://vlc.nccommunitycolleges.edu. Contact Kathy Davis, Distance Learning Specialist, at
davisk@nccommunitycolleges.edu, to obtain a login and password to download a VLC Course.

Appendix D

Open Source Collaborative: Moodle Assessment Report

Executive Summary

Abstract

Moodle open source course management system (CMS) has been found to be a viable alternative to Blackboard; the proprietary CMS used by the majority of North Carolina Community College System (NCCCS) institutions. This conclusion was reached by a team of NCCCS staff using three independent research techniques - each of which verified the findings. The three techniques included functionality comparisons, end of term survey results by both instructors and students, and case studies of four NCCCS institutions that have migrated from Blackboard to Moodle.   The study reports that the CMSs had similar overall application functionality and the faculty and students seem equally satisfied with the CMSs ease of use.   The case studies indicated that migration from Blackboard to Moodle is challenging and resource intensive at the college level but the four Moodle colleges are uniformly satisfied with the results and report reduction in overall costs. The study identified lack of "instructor comfort" with both CMSs suggesting more effective instructor training is needed. However, this study did not fully address the issues of technology and funding framed in terms of scalability, compatibility, and interoperability of all learning technology applications used in the NCCCS. The team recommends a determination of the technical and financial solutions required for the next stage of CMS utilization within the North Carolina Community College System.

Rationale for Report

At the meeting on March 19, 2009, the North Carolina State Board of Community Colleges' Finance and Capital Needs Committee requested a Moodle Assessment Report to determine the status of "Moodle as a viable open-source alternative to the proprietary Blackboard online course management system (CMS)." M.O.O.D.L.E., or Modular Object Oriented Dynamic Learning Environment, is an open source online course management system. The North Carolina Community College System Office currently funds the license fees for the proprietary Blackboard Enterprise CMS for a minimum annual cost of $1,400,764 for service to 52 colleges across the state (see Attachment Vbi: NCCCS CMS Contract History in full report).

Currently, four NCCCS institutions use Moodle exclusively: Isothermal Community College, Blue Ridge Community College, Guilford Technical Community College, and Southeastern Community College. Each of these four community colleges selected Moodle CMS for various reasons, cognizant of the challenges and expenses that would be involved in such a migration. At the writing of this report, four additional NCCCS institutions are actively pursuing Moodle as their primary CMS for the future. The Report compares the specific functionality, utility, ease-of-use, and total cost of ownership between both Moodle and Blackboard CMSs in these categories. While there are existing Moodle/Blackboard comparison studies across the nation, they do not specifically reflect the needs, capabilities, and unique culture of the NCCCS.

Moodle Assessment Approach

The study targeted academic concerns such as course navigation, ease of use, communication and collaboration tools, course content, assessment, and upload capabilities. To this end, a triangulated study was created to fully investigate Moodle as an effective learning/teaching platform through (1) student and instructor surveys, (2) functionality comparisons between Moodle and Blackboard, and (3) case studies from institutions which have fully switched to Moodle as their CMS. In each case, academic considerations were the top priorities, however, as the study evolved, the team discovered a need for more technical and total cost of ownership information. Thus the scope of the study expanded to accommodate these areas.

Background

In May 2008, the State Board of Community Colleges approved a contract with the University of North Carolina General Administration (UNC-GA) to establish the joint Systems Open Source Collaborative Moodle Assessment. Open source collaboration was attractive to both the NCCCS and the UNC-GA. Moodle was selected as the first CMS software for pilot use by institutions in both Systems. Emphasis was placed on assessment of Moodle to discover if "Moodle is a viable open source alternative to Blackboard," the proprietary online CMS used by the vast majority of all North Carolina public institutions of higher education. Open source describes software distributed under licenses guaranteeing anyone the rights to freely use, modify and redistribute the source code. The open source paradigm allows concurrent input of different functions, approaches and priorities which differ from the more closed, centralized models of proprietary software development. Moodle is supported by a trust that consolidates the contributions of many e-learning professionals and programmers.

The North Carolina Moodle Users Group (NCMUG) was established in 2006-07 by funding provided from Senate Bill 622- 2+2 UNC/NCCCS Initiative for the express purpose of finding a cost effective alternative to proprietary CMS products, as several NCCCS institutions were actively experimenting with Moodle at the time. NCMUG was formed to consolidate the efforts of those colleges. NCMUG provided administrator and instructor training, hosted courses and system administration services through a contract with Remote-Learner, a Moodle partner. NCMUG eventually provided Moodle services to a total of 15 community colleges and 2 UNC institutions. Successes of NCMUG were the catalyst for the Open Source Collaborative Moodle Assessment.

The first stage of the Moodle Assessment began in March 2008 when funds were approved to provide hosted hardware, application administration, training, and customized programming in critical areas to support a centralized Moodle implementation project capable of supporting 100,000 online students and providing a testing platform for multiple community colleges. At the time of this Report, 19 NCCCS institutions have independent virtual Moodle instances hosted at the Microcomputing Center of North Carolina (MCNC).

This second and final stage of the Moodle Assessment was to formally determine the viability of Moodle through end-of-semester surveys, college case studies and the Blackboard/Moodle CMS Functionality Comparison Survey. The full Moodle Assessment Report and this Executive Summary complete the second stage.

Methodology

End of Term Survey Methodology - In April 2009, the project team delivered two end-of-term evaluation surveys to participating colleges. Six Blackboard NCCCS institutions were selected to participate in the study: Caldwell, Edgecombe, Montgomery, Robeson, Rockingham, and Southwestern Community Colleges had comparable Distance Learning curriculum enrollments to the four Moodle colleges. These colleges used Blackboard exclusively and had no experience with Moodle, and as such were considered Blackboard colleges to prevent any crossover of Moodle influences; thereby reducing the potential for bias. The survey was administered to all distance learning students and instructors at the 10 participating colleges.

There were Instructor and Student end-of-term evaluations for both Moodle and Blackboard users. The two surveys were identical with the exception of differences in terminology and functionality particular to each CMS. Only students and instructors who had at least one semester of experience using the CMS in a "hybrid/blended or completely online course" were invited to participate. Participation was voluntary and anonymous.

Data from both the student and instructor surveys were analyzed using a descriptive statistic and a t-Test comparison of means analysis. These types of analyses are appropriate when comparing the means of two groups.

Case Study Methodology

In March 2009, a questionnaire was sent to the four Moodle colleges. Follow-up responses were collected through email, phone conversations and Word documents pertaining to:

- Reasons and decision making for the migration
- Implementation strategy for the migration
- Training and orientation for students and faculty
- Current status of college CMS
- Total costs of ownership

Moodle colleges provided the Project Team with additional data which had been utilized throughout their transition(s) such as PowerPoint presentations, meeting agendas, minutes, etc. to give a more expansive view of the migration process. This presented some challenges in collating the data, however, the additional information proved invaluable in presenting a comprehensive view of the transition process.

Functionality Comparison Methodology

In March 2009, a CMS Functionality Comparison Matrix questionnaire was provided to online instructors and distance learning (DL) administrators at all 58 community colleges. Both online instructors and DL Administrators were invited to participate, as the assessment team sought the differing perspective provided by the "back-end" users, i.e.: DL administrators and the "front-end" users i.e.: instructors. Participation in the comparison was voluntary. The objective was to compare functionality of the current versions of Moodle and Blackboard. Respondents were requested to answer only questions pertaining to their college's current CMS, either Moodle or Blackboard.

Results and Analysis

End of Term Survey Results

The Student End of Term Survey recorded 1,127 student responses from the 10 participating NCCCS institutions. Two hundred forty-eight students were from the Moodle institutions and 879 students were from the six Blackboard institutions.

The Instructor End of Term Survey recorded 199 instructor responses from the 10 participating institutions - 93 from Moodle institutions and 106 from the Blackboard institutions.

The Project Team completed a descriptive statistical analysis for the Student End of Term Survey using a t-Test comparison of means analysis. Additionally, the Project Team consulted with researchers from the William and Ida Friday Institute for Educational Innovation, affiliated with NC State University, who performed an exploratory factor analysis (EFA) and multivariate analysis of variance (MANOVA). These tests allow researchers to examine the internal reliability of the survey.

The Project team completed a descriptive statistical analysis and a t-Test comparison of means analysis for the Instructor End of Term survey. No underlying trends were identified as requiring analysis from the Friday Institute.

The survey analysis shows no real difference between Blackboard and Moodle, however, students' perceptions of instructor comfort levels with either CMS were significant. Also significant was whether students received an orientation in the CMS. Supporting this finding was the Friday Institute's statement, "Blackboard and Moodle are not that different. The real difference is found in students' perception of their teachers' comfort level with the application. There exists a significant correlation between student survey scores of both Blackboard and Moodle with the perceived comfort level of instructors using either application."

Thus, student perceptions are most influenced by instructor experience (training and staff development) and the students' own experience using the application and/or receiving an orientation to the CMS.

These findings were verified by the initial t-Test analysis, completed by the project team, which revealed that only three questions were statistically significant out of 38 in the data set. The findings were also verified by the EFA and MANOVA analyses completed by the Friday Institute.

Case Study Results

Results of the case study questionnaires were compiled by the Project Team. Follow-up information was needed in the areas of total cost of ownership and the current status of the Moodle CMS at those colleges. The Project Team reviewed and compared the information reported from the four Moodle colleges for the case study analysis.
Moodle Assessment case studies reveal that migration from an established proprietary course management system presents major challenges; however, all four case study institutions willingly took on this challenge with reported success and satisfaction with the migration.

Challenges

Migration to Moodle requires considerable time, funding and resources. Migration disrupts existing processes, systems, and people. Comprehensive planning must precede

implementation. Both Blackboard and Moodle CMS solutions must be operating at production levels simultaneously throughout the transition period. This requires additional funding for the transition period. Open source cost savings won't be realized until transition is complete and the college is supporting only one CMS. Case Studies provide a means to document critically important, in-depth experiences and best practices derived from actual community college migrations from Blackboard to Moodle. Migration away from an established, mission-critical application is a serious undertaking. Every aspect of training, support and instructional methodology, as well as application and finance is affected.

The case studies provide insight into how very unique institutions as defined by size, location, specific needs, and skill sets of staff and faculty accomplished such a challenging undertaking. Details of the migration strategies follow.

Reasons and Decisions for the Migration

Each of the four colleges reported independently that dissatisfaction with Blackboard in the form of application problems, server performance, technical help desk delays, unacceptable hosting solutions, and increasing costs were the primary reasons for seeking an open source CMS solution. Frustrations with these recurring problems were sufficient incentive for college support and academic staff to seek alternatives.   Isothermal Community College expressed difficulty training faculty with vendor resources without additional costs. Isothermal questioned the total value of Blackboard software. Guilford Technical Community College reported failing upgrades, lost content, and weekly system crashes. Faculty and students were frustrated.

Implementation Strategy for the Migration

NCMUG institutions had a distinct advantage as they benefited from uniform training, support, and hosting. Each had received a turn-key Moodle installation that was supported for three years. At each of these institutions a Moodle administrator was trained and available as were five instructors. Of the 15 NCMUG community colleges, all but two are actively using Moodle for instruction. Case studies indicated that migration strategies are composed of the following steps:
1. Create a leadership team charged with creating a migration plan and oversee its implementation. This team would generally consist of IT and distance learning staff, academic leadership, representatives from Business Offices and skilled instructors.
2. Establish first a pilot and then production Moodle environments.
3. Develop orientation and training resources for instructors.
4. Enroll early adopters for using Moodle in classroom instruction.
5. Phase in instructors from each department.
6. Generate feedback, performance measures and assessment resources to measure progress and success.
7. Create orientation and support resources for students.
8. Select a transition period.
9. Implement the plan and include continuous improvement strategies.

Training and Orientation of Students and Faculty

The Case Study indicated that robust orientation and training resources are critical to the success of any CMS. Online instruction has been used extensively in all NCCCS institutions for nearly a

decade, and introducing a new CMS allows colleges to capitalize on the extensively skilled faculty and staff needed to develop innovative and appropriate orientations to the remaining faculty, staff and students who will need training in the new CMS.   Moodle, as a world-wide open source application, does lend itself to collaboration. Moodle.org provides a tremendous collection of resources readily available to administrators and instructors. NCMUG institutions freely shared Moodle orientation and training resources. Jonathon Sweetin, one of the writers of this report, and Tina Farmer of Pitt Community College developed an excellent Moodle training manual for instructors which was adopted by two of the case study institutions. Similar resources were shared among NCMUG and case study institutions. Thus basic resources were readily available.

Courses and Resources Migration Strategy

Case studies report that course migration represents a major drain on college resources. There is no one-to-one migration tool for converting Blackboard courses to Moodle. Estimates for purchasing services for course conversion varied from college to college. Converting extremely sophisticated courses with large and numerous files often costs more. Course migration is a one-time fee and costs can be shared across departments and institutions. Professional assistance in course conversion was also available from Moodle partners, and some colleges contracted with vendors to provide course migration assistance and training. In most cases, however, community college staff attained the skills to migrate their own courses via Moodle partners. Overall, migration to Moodle was successful as indicated by the following comments received in the case studies.

"Moodle allows us to explore more team teaching than ever before....in Moodle, faculty can work together to create content while keeping their individual sections apart....after using Moodle for a year, many of the faculty members who were negative about the switch have since changed their minds. Having their content intact made them more confident about Moodle....overall, we consider the move to Moodle a success." *Guilford Technical Community College*

"[Moodle] has all of the features we need to develop and deliver high-quality online courses. Students like the interface and find it easy to use...we are very satisfied with Moodle and look forward to expanded features and uses as time goes on." *Blue Ridge Community College*

"After the initial migration, a stable, easy to use Moodle platform made subsequent distance learning [enrollment] growth...by reducing barriers and providing a smooth platform for distance learning instructors. Moodle was found to be less complex and more usable by faculty. Compared to the Vendor CMS, Moodle has proven to be a more user-friendly system resulting in increased use by the majority of college faculty and more satisfaction [reported] from both faculty and students." *Isothermal Community College*

"The Moodle implementation was successful. Students like the interface and require very little assistance with course navigation. Faculty who have spent time working with Moodle are very satisfied with it." *Southeastern Community College*

Total Cost of Ownership

The Total Cost of Ownership analysis for the Moodle migration was organized into three one-year reporting periods. The first year being the pre-transition year or "Blackboard Only" year; the second year being the transition year when the colleges use both CMS applications at the same time; and the third year or the post-transition year when the college is completely migrated to Moodle. The Project Team categorized the college's migration costs into four main expenditure areas: CMS License Fees; Self or Vendor Server Hosting and Administration Fees; Faculty or Staff Training Fees; and Blackboard to Moodle Course Conversion Fees.

The analysis revealed the total pre-transition year cost for all four case study colleges totaled $184,410. There was a 35% increase in total cost in the transition year to $248,300, due to supporting two CMSs. Lastly, the post-transition year cost of ownership was $52,296, which accounted for a 72% decrease in total cost compared to that of the pre-transition year. The total cost savings from pre-to post-transition years for all of the case study colleges was $132,114.

Functionality Comparison Results

One hundred thirty-seven online Instructors from 28 of the 58 community colleges participated in the CMS Instructor Functionality Comparison. Thirty-six DL administrators from 27 of the 58 colleges participated in the CMS Administrator Functionality Comparison.

A modified frequency count was utilized to determine the highest level of perceived functionality of the CMSs. Moodle 1.9.x had the highest instructor perceived functionally rating with a yes vote total of 220. The instructors believed that Moodle had better functionality in 220 of the 283 total functionality questions. Blackboard 7.x/8.x Academic Suite came in second with 203 yes votes. Blackboard 7x Learning System finished last with 173 yes votes. There was not enough data reported on the Blackboard 8.x Learning System to compare the functionality. Moodle 1.9.x had the highest administrator perceived functionally rating with a yes vote total of 89. The administrators believed that Moodle had the better functionality in 89 of the 111 total functionality questions. Blackboard 7.x/8.x Academic Suite came in a close second place with 87 yes votes. Blackboard 8.x Learning System was evaluated to have 70 yes votes. Blackboard 7.x Learning System finished last with 54 yes votes. Blackboard version 9.0 was not in use by any NCCCS institutions at the time this study was conducted. Blackboard 9.0 is currently undergoing evaluation by several community colleges.

Conclusions

The project team concludes that Moodle is a viable option to Blackboard. This conclusion is supported by the following findings:
1. The end of term student and instructor surveys showed that Blackboard and Moodle are not that different. The real difference is found in student perception of their teachers' comfort level with the application. There exists a significant correlation between student survey scores of both Blackboard and Moodle with the perceived comfort level of instructors using either application. Thus, student perceptions of both CMSs were influenced by instructor experience, training, and skills.
2. The CMS application functionality comparison by online administrators (application and network) and online instructors indicated that Moodle 1.9x has a higher perceived

functionality than any version of Blackboard evaluated. The large number of "did not use" responses suggested that neither CMS platform was utilized to full capacity.
3. Case studies of four exclusively Moodle institutions indicated that while transition to Moodle was challenging, ultimately the case study students and faculty preferred Moodle over Blackboard. The case studies also indicated that during transition, because Blackboard and Moodle CMS solutions needed to be simultaneously operable, more funds were required for the transition year before open source solution savings could be realized. A successful migration transition strategy was required in which:
   - Appropriate administration, technical support, and academic leaders/representatives were involved and empowered to design a transition plan.
   - Moodle was established at a testing and training level.
   - Production-level solutions were verified.
   - College-wide training was planned, scheduled and implemented.
   - An assessment strategy was created in parallel.
   - Migration to Moodle was accomplished.

4. The Project Team concludes that this study has only addressed the academic considerations of Moodle as a viable alternative to Blackboard. This study did not fully address the issues of technology and funding as framed in compatibility and interoperability of all learning technology applications.
5. NCCCS currently contracts with Blackboard to provide Online Help Desk technical support for students taking both Blackboard and Moodle courses. Cost for expansion of online help desk support is likely to increase during transition periods – periods with dual CMSs are required.

Recommendations

Academic considerations regarding Moodle/Blackboard functionality and usability have been thoroughly addressed in this study. The Project Team finds that Moodle and Blackboard now represent a "binary CMS" situation in the NCCCS. Moodle is now and will remain the primary CMS for a growing number of NCCCS institutions. This is due to the functionality, flexibility, performance, and cost-effectiveness of Moodle. Thus, Moodle deserves continuing support and promotion by the NCCCS Office. Therefore, an exclusive Blackboard solution is no longer practical, given the progress/interest of Moodle at our institutions. There does exist the possibility of a hybrid of Moodle/Blackboard CMS as demonstrated by Blackboard to NCCCS staff in their March 2009 presentation of Blackboard version 9.0 and subsequent planned Blackboard 9 series versions.

The Project Team recommends determination of the technical and fiscal criteria required for the next stage of CMS utilization within the North Carolina Community College System. Options to consider include:
   - Status quo (obvious short term solution).
     - Adoption of Moodle as a secondary CMS.
     - Continuation of Blackboard as the primary CMS.
   - Adoption of Moodle as the primary CMS.
   - Development of an interoperable hybrid or blended use of both Moodle and Blackboard.
   - Selection of a suitable future CMS solution via Request for Proposal.

Thus the next issues to be addressed are technical and financial – framed in a feasibility study to answer the question: "What is the best CMS solution for the NCCCS?" Technical and financial issues to be addressed to answer this research question include:

- Projected expansion of hardware/hosting needs required as NCCCS institutions adopt more robust applications, use of integrated software solutions, and increased use of existing functionality.
- Technical training for instructors and administrators.
- Interoperability and compatibility with all learning technology applications
- Centralization of applications to reduce overall costs to NCCCS - realization of economies-of-scale in all regards - System-wide hosting solution.
- Support for dual production environments during migration periods.

The Project Team recommends that the proposed Study Group be composed of representative stakeholders in the NCCCS, and that a "feasibility plan" providing guidance regarding the future CMS in the NCCCS should be developed by the end of fiscal year 2010.

Final note: Currently the NCCCS Office only provides funding for (1) the current Blackboard contract providing Learning System software for 52 clients and (2) the Open Source Collaborative Moodle installation hosted through a contract with UNC. One major concern is the future role of the NCCCS Office in supporting any decision that requires more funding and staff support than is currently available.

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