

AC 2007-2624: CREATING A SCALABLE, ROBUST DISTANCE EDUCATION CAPABILITY AT EAST CAROLINA UNIVERSITY

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Creating a Scalable, Robust Distance Education Capability at East Carolina University

Abstract

The core infrastructure for successful online educational systems is driven by several competing factors including: technical capabilities, communications systems, professional resources, faculty expertise, and student-centric requirements. Systems must address issues such as: the developmental and delivery technologies being utilized, the academic and physical demands of the course, economic conditions, time and space constraints, and evolving technologies that affect product quality and effectiveness over time. All of these factors must be considered throughout the design and development process. There are also factors which influence the design and setup of an integrated model for online education. Assessing the types, quantities, and capabilities of equipment, software, and teaching methodologies has become an issue which must be addressed at every turn in order to keep up with student demands for high quality educational programs and to maximize various delivery methodologies.

The primary goals of an effective distance delivery protocol are designed to promote student success and to help faculty build the requisite skills needed to develop, deliver, and promote an optimal learning environment. The College of Technology and Computer Science at East Carolina University has embarked upon a multi-disciplinary approach to identify current state-of-the-art delivery methodologies that support distance education, including hardware and software tools, delivery portals, instructional pedagogies, student expectations, and developmental support systems to enable faculty to create professional products for use by a broad audience. A college-level task force has been created to define best practices in the DE world and to establish the necessary infrastructure to operate effectively in this environment. The purpose of this article is to provide an overview of “best practices” in online learning, and unveil a scalable online course sequence model which will promote student success in College of Technology and Computer Science at East Carolina University.

Growing Demands for the Bachelor of Science in Industrial Technology Program

The B.S.I.T. program is a 2+2 undergraduate program, designed as an online completion curriculum for students who have been awarded a qualified Associate in Applied Science (AAS) degree in Industrial Technology or closely related field. The courses completed in the qualified technical AAS degree provide the foundation and half of the technical courses required in a major for the Industrial Technology degree. This BS degree program has the flexibility to allow students to tailor a curriculum to their specific career goals. Concentrations available via online DE include: Industrial Distribution, Information & Computer Technology, Manufacturing Systems, Industrial Supervision, or Bioprocess Manufacturing. The Bioprocess Manufacturing degree was developed within a year to address the needs of North Carolina’s workforce and to align with the community college’s BioNetwork. The curriculum for all the programs also has a strong emphasis in management, which allows the graduate to function well in either technical or decision-making career fields. Almost 100 AAS degrees in the North Carolina Community College System (NCCCS) have been identified as potentially aligning with the B.S.I.T. program. Currently, articulation agreements with 60 programs at 7 community colleges have been signed

and more are being established each semester. A variety of other articulation agreements are in various stages of development with additional community colleges. This pilot program will promote accessibility for all students and is the only such program at public and private universities in North Carolina and surrounding states that allow those with technical AAS degrees to enter a BS degree with junior standing and significant completion of the requirements for the BS degree. With this type of expansion, a new way of handling large sections or classes is necessary.

Background

Though this project addresses the need of the citizens of North Carolina to access degree programs which provide technology-based careers and provides the technology-based workforce necessary for today's industries, the model was also developed to prepare the university system for dealing with expansion in an effective manner, one which promoted student success. Specifically, this project identifies the need to deliver a high quality, cost-effective, and scalable distance education (DE) education program that provides a Bachelor of Science in Industrial Technology degree with realistic completion opportunities for community college Associate of Applied Science (AAS) degrees graduates.

The goals of this project are to highlight efforts which will: (a) Continue to build on a strong partnership with the community college system throughout North Carolina, (b) Develop a cost-effective educational delivery methodology to reach citizens in rural as well as urban areas across the state, (c) Retain highly qualified individuals in a variety of high-technology and other industries by providing "as needed, when needed" educational programs, and (d) Enhance the ability to take the program off-model to meet the needs of students and employers beyond the local area, addressing the university mission statement, and (e) Support the mission of the College of Technology and Computer Science at East Carolina University (TECS).

The College of Technology and Computer Science (TECS) was created in 2003 stemming from the School of Industry and Computer Science which was created in 1971. During FY 2003, as growth occurred, the College began occupying the first, second, third and fourth floors of the Science and Technology building along with the C-wing. Over the past three years, TECS has increased its undergraduate enrollment by 80% and by 180% in the past four years, though faculty member numbers have increased by only 25%. Additionally, the TECS operating budget has grown by only 15% and that budget growth took place within the 2005-2006 fiscal year. All increased funding to the college has result from new student growth funds generated by the UNCS funding matrix. Consequently, application of faculty and support funding typically arrives 2 years after the students, and after semester credit hours are generated, creating a deficit in current year funding each year.

Over the course of the last year, a new online B.S. engineering program has been added, and three new master's degree programs are in the approval process. A proposal for a Doctorate of Technology (DTS) has been submitted and is in the review/approval process at the university level. Table 1 notes the semester credit hours (SCH) both in the college and in distance education generated over the past 5 years. In 2005-2006, there has been a total semester credit hour increase of approximately 40% over the 2001-2002, and an undergraduate increase of

approximately 220% in distance education SCH in the College of Technology and Computer Science between 2001-2002 and 2004-2005. For the same four year time period, FTE growth was noted at only 185% in distance education. Table 2 notes the available FTE over the past four years.

Table 1.
Semester Credit Hours Generated

Academic Year	SCH's	Total DE	DE Undergrad	DE Graduate
2001-2002	15,599	1,641	378	1,263
2002-2003	17,172	1,976	576	1,400
2003-2004	19,484	2,817	1,065	1,752
2004-2005	23,454	3,573	1,665	1,908
2005-2006	25,700	4,492	2,424	2,068

Table 2.
Total FTE

Academic Year	UG FTE's	Grad FTE's	DE FTE's	Reg FTE's	Totals
2001-2002	37.28	12.37	8.89	40.77	49.65
2002-2003	41.28	13.08	10.28	44.08	54.36
2003-2004	46.91	14.68	13.81	47.78	61.58
2004-2005	57.35	15.66	16.43	56.60	73.01

The above data set is provided in order to note a pattern of hyper-growth within the College of Technology and Computer Science distance education courses. Table 1 indicates that over the past 4 years the total semester credit hours has risen an average of just over 23% per year with undergraduate distance education semester credit hours jumping an average of just over 40% per year.

Projected Growth Model

There are over 28,000 AAS graduates per year in the North Carolina Community College System. Approximately half (or 14,000) of those are “technical” AAS degrees that could conceivably articulate to the BSIT program. When adding that number of graduates to those from other community colleges who have moved to North Carolina, the potential market for this degree is over 250,000 students strong today. No other state university or private college offers a path or program for AAS graduates to build towards a BS degree in the State of North Carolina. If only 10% of the possible market were to pursue degree, that would provide a initial market of over 20,000 with at least another 1500 students potentially entering the market demand ever year. This is assuming only 1 in 10 students wish to pursue a BS degree online. All indications are that there is a much higher percentage of adult students who are planning to pursue a B.S. degree. Further, addressing this market contributes to supporting a technology-based workforce sought by the State. That goal is to provide a continued path for developing an increasingly competent and highly trained technology-based workforce.

When considering a fluctuation rate of 8% in undergraduate distance education semester credit hours, the projected expected growth pattern ranges from a 27% to 48% increase in SCH within the next consecutive four year period. (see Table 3)

Table 3.

Project Growth in SCH for DE (Conservative 27%/yr)				
Academic Year	SCH's	Total DE	DE-Undergrad	DE-Graduate
2006-2007	32,639	5705	3078	2626
2007-2008	41,451	7245	3909	3335
2008-2009	52,643	9201	4964	4235
2009-2010	66,857	11,685	6304	5378
2010-2011	84908	14,839	8006	6831

This project proposes expansion of academic programs, particularly the Bachelor of Science in Industrial Technology (B.S.I.T). This program targets adult learners and is directed at meeting the needs of the State of North Carolina to further develop and increase its technology-based workforce and to provide educational opportunities for working professionals. These efforts speak directly to addressing workforce development in North Carolina, providing for continued development opportunities for community college graduates, and meeting the need for high-demand, critical-shortage areas of technology-based professionals. Due to time constraints, adult responsibilities, and job requirements, this particular audience would be best served through the Distance Education (DE) venue and particularly through any place, any time, any pace online course work. The College of Technology and Computer Science, in its endeavor to meet student requirements, is committed to supporting growth in a technology-based workforce within the State of North Carolina,. This commitment supports a scalable expansion of the Bachelor of Science in Industrial Technology (B.S.I.T.) program and several related concentrations.

Best Practices in Online Education for Adults: Theories in Online Education

In order to develop this model, several considerations were reviewed in the preliminary design. “Theories such as Wedemeyer’s Theory of Independent study, Holmberg’s Theory of Interaction and Communication, and Simonson’s Equivalency Theory all provide structure for improving program design”² Theories concerning online education “best practices” were considered. In 2000, a report by the Web-Based Educational Commission (WBEC) to Congress noted several issues affecting online educational content. The report called for action in seven areas, two areas being “Revise outdated regulations that impede innovation and replace them with approaches that embrace anytime, anywhere, any pace learning” and “Develop high quality online educational content that meets the highest standards of educational excellence.”³

Creating this “best practice” scenario also heavily involved faculty. In 2004, Santovec stated, “successful online programs exhibited two specific characteristics; high-quality course content and faculty that actively engages their students.”⁴ Chickering and Ehrmann⁵ laid the foundation to these “best practices” by continued focus on immediate, in-course faculty issues

with the *Seven Principles of Good Practice*. The principles consist of (a) encouraging multiple contacts between students and faculty, (b) developing reciprocity and cooperation among students, (c) promoting active learning techniques, (d) giving prompt feedback, emphasizing time on task, (e) communicating high expectations, and (f) respects diverse talents and learning styles. In order to accomplish this tall order, a framework or organizational structure based on the educational philosophy, social economic and political restrictions of the institution is needed to clearly define online education in order to incorporate these critical pieces.^{6, 7, 8} There are seemingly three approaches to this structure; (a) centralized, (b) decentralized, and (c) hybrid, each with its own unique limitations.⁹ For the purpose of this framework, a centralized structure would best describe the system, while at the same time, working toward meeting all aspect of “best practices.”

Three Phases of Program Development

In order to meet the demand resulting from the projected growth in AAS students seeking a BS degree, a new delivery model has been defined to provide support needed to meet the anticipated student enrollment in the B.S.I.T. online program. This pilot program will consist of three phases which would encompass a four-year period. These three phases would form the foundation for future DE programs at ECU and would guide and support the development of the Strategic Plan and its associated timelines. Teams and committees are being tasked with activities and actions resulting from this planning activity. A Distance Education Task Force is meeting for the first time in mid-January 2007 to begin developing the strategies, policies, procedures, and implementation plans to address the projected growth model.

Phase One of the Scalable DE Model for the BSIT

During Phase One the selected group of course materials would be developed by content experts in order that all course content consistently meet appropriate, mandated standards, and “Best Practices” in online education. This phase would also lay the foundation for future online SCH loading and housing for online courses. Phase Two would consist of teaching and revising course materials in order to clarify course content and presentation of the content, and solidify the online model. Phase Three consists of the finished course content in an approved presentation format which would be taught and monitored for three additional years. After that time the course content would periodically be reviewed and updated with current issues within the content materials. This phase would monitor progress and provide research for further definition which could be applied to other online programs. Each phase would take a period of from one to one and a half years to complete.

Phase I – Development of Pilot Program Online Courses

During Phase I, the following actions will be taken.

1. Review Strategic Plan for development of online model and Timeline
2. Identify and Furnish Required Facilities
3. Hire Development Staff
4. Design Video/Audio Recording Capabilities
5. Enhance Internet Infrastructure and Support

6. Identify Online Platform
7. Develop Online “Best Practices” Standards For all Stakeholders
8. Develop Student Outcome Standards
9. Development of Online Policies & Procedures
10. Development/Create/Design four Core Course Materials
11. Develop Assessment/evaluation Structure
12. Package Course Materials
13. Construct& Set-up Technology Infrastructure
14. Develop Faculty & Staff Training Structure
15. Develop Student Support Infrastructure
16. Market B.S.I.T. Online Program & Recruit Students
17. Recruit & Hire Faculty and Staff for Implementation

Development of Courses and Course Materials

A course development team will commence developing the four core courses during Fall 2007. This team will consist of three to four faculty members who are familiar with and/or have taught one or more of the four core courses. The focus of this team would be two-fold; first to develop consistent content for each of the core courses, and secondly, to select the specific courses to develop in order to align the program. The team would consist of content developers, subject matter experts, a graphic designer, an instructional designer, and technical support. A mix of newly hired and in-house faculty from the content discipline would be consulted and utilized within the team.

Course materials would be developed utilizing mapping and chunking which would result in content being developed in small stand alone bytes governed by concepts. Course chunking would allow flexibility in usage of course chunks as other courses were developed, resulting in chunks being pulled and used as support for prior knowledge or as review materials for other courses. Courses would include an introduction (Hook), a combination of relevant concept chunks (content), and a conclusion (Tie-up). For example the introduction might be an example of what the learner will learn, how this would be presented, and an example of how this would be used in the real world, the concept chunks would consist of the course concept chunks, and the conclusion would present a review of chunks along with a process of tying together and cementing of concept chunks. While the Learning Manager would present the Introduction and the Conclusion, the Content Integrator would guide student through the learning of concept chunks. Each online course could vary in consistency of chunks depending upon the demand of the course work, and extend over an eight week period. Successful completion of course materials would result in three credit hours of coursework.

Courses which require more that eight to ten chunks should be realigned to fit the eighteen chunk model, or reassign remaining chunks to a next sequence course. Courses of more than eight chunks could roll into a longer course time-period but this would require a rethinking of credit hour assignments and curriculum wide modifications. Concept chunks would further be broken down into lessons and with one evaluation per chunk. If concept chunk scaffolding is the course goal, it could require that chunks be mastered in sequence (see Figure 1). If concept

chunks were stand alone units, such as a review of software programs, these could be taught and mastered independently (see Figure 2).

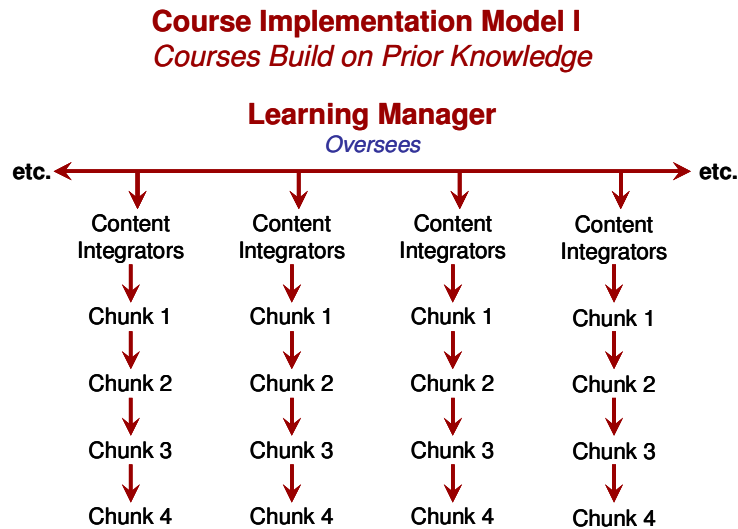


Figure 1. *Course Implementation Model 1: Building on Prior Knowledge*

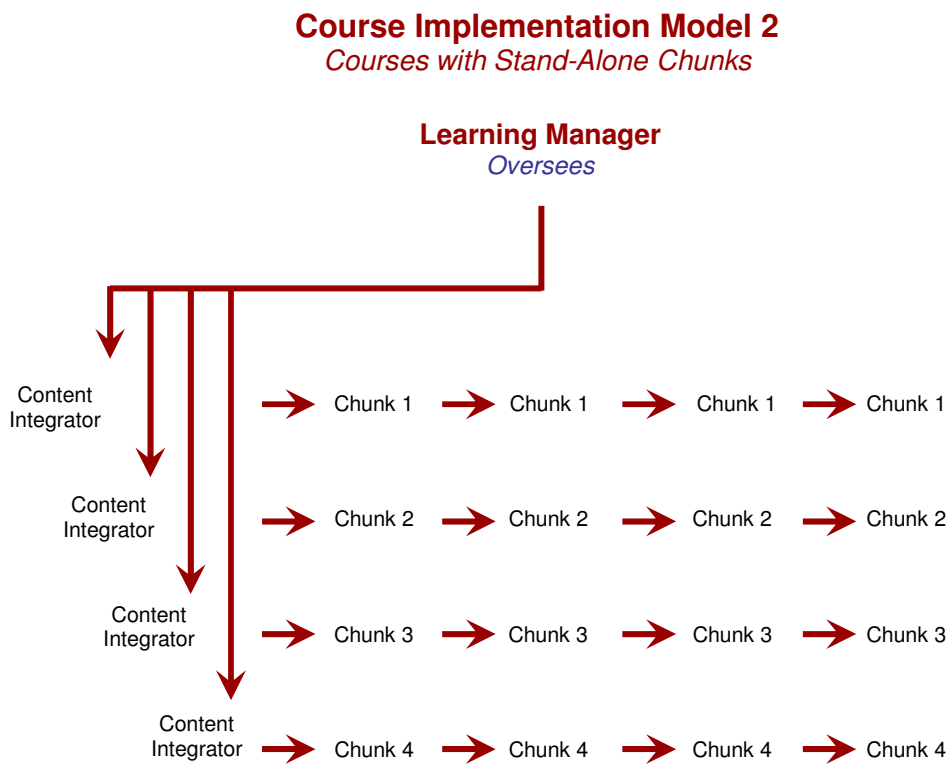


Figure 2. *Course Implementation Model 2: Stand Alone Concept Chunks*

Development of Course Resources

Resource materials and a structured course frame would be developed in order to guide and provide support for both Learning Managers and Content Integrators. Resource Materials would include Training for Learning Managers, Student Advisors, and Content Integrators, Procedures for online learning, and Support Websites. Course materials would include learning objectives for the course, course mapping, matching objectives with content and evaluations, examples of high quality assignments, discussion topic outline & supporting materials, readings & supporting articles, suggested textbooks, and a list of faculty resource websites. The Structured Course Frame would include: course plans (syllabus), high quality video, & audio, conferencing/chat/threaded discussions, textbooks, student notes, interactive assignments, lectures, PowerPoint presentations (PPTs), simulations & activities, rubrics, and group project suggestions (see Figure 3).

Faculty members working as content developers and/or subject matter experts throughout the teaching/revision phase would be provided a one-quarter course release. A second team consisting of a mixture of new and experienced developers would begin development of the next set of four courses in the prescribed sequence as the original four core courses are being taught and revised. After the first semester of development, during any one semester, courses would both be developed while developed courses were being taught and revised. A portion of the development timeline is presented below in Table 4.

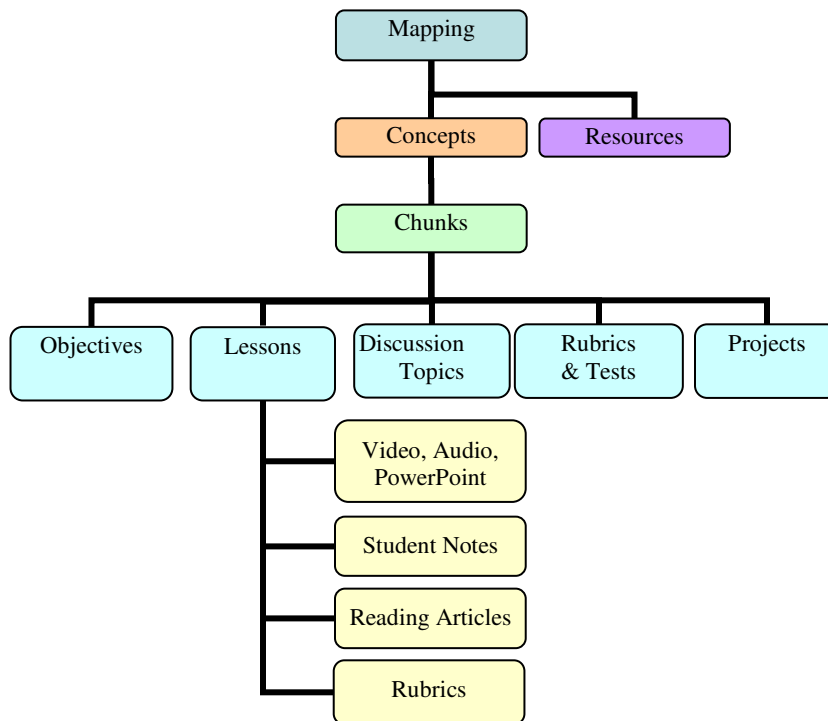


Figure 3. *Example of Items Which Might Make-up Course Materials*

Table 4.

Example of Development and Scheduling of Course Expansion

Spring I Year 1	Fall I Year 1	Fall II Year 1	Year 2	Year 3	Year 4	Fall II Year 5
Develop 4 Core Courses (2 FTEs)	Teach & Revise 4 Core Courses (1 FTE)	Teach Course Content				Begin Content Review & Update (1 FTE) 4 Core Courses

Phase Two of the Scalable DE Model

The second phase of development will include a continuation of activities initiated during Phase One but will build upon the pilot program so the model can be sustained over the long term. An obvious component of Phase Two will be adding sufficient staff to handle the increased scope of work and to provide the essential training to enable the new team members to learn from those who were active participants during Phase One.

Phase II – Implementation of Online B.S.I.T. Program

During Phase II, the following actions will be taken.

1. Complete Set-up of Online Platform
2. Complete Hiring of Learning Managers & Content Developers
3. Complete Training of Faculty & Staff
4. Review Student Support Infrastructure
5. Revise Marketing Materials to Reflect New Course Structure
6. Monitor/Address Accessibility Issues
7. Integrate Technology Infrastructure
8. Implementation of Teaching Online using “Best practices”
9. Continue to Align Online Courses with Discipline and Adult Learning Standards
10. Monitor Course Teaching
11. Monitor and Adjust Course Content
12. Monitor/Evaluate B.S.I.T. Program
13. Evaluate Course Development and Faculty Training
14. Establish Assessment/Evaluation System
15. Assess Student Success Standards

Implementation of Online Structure

While some members of the course development team, including content developers and subject matter experts would be hired directly, others could be pulled from specific discipline areas within the College. They could then receive one-half time course releases in order to develop the instructional materials for the four core courses. The goal here would be to have these four courses ready to implement in the first half of Fall 2008. These same faculty members would then teach and make revisions to the developed materials during the second half of the Fall 2008 semester in order to provide materials to support teaching the core courses over the

three years. At that time the materials would be re-evaluated through an update process, as needed.

The implementation structure would consist of one Master Learning Manager for each 80-160 students. Their responsibility would be to manage the structure of the course and course materials. One Academic Advisor for each 200-250 student load would facilitate and have direct contact with students in order to align personal issues, course advisement, and college support. Content Integrators, each with a 20-25 student load, would be responsible for moving students through the course materials, providing connections and incorporating real-world activities and experiences into the learning experience. Figure 4 is an example of student support which would be provided by the implementation structure.

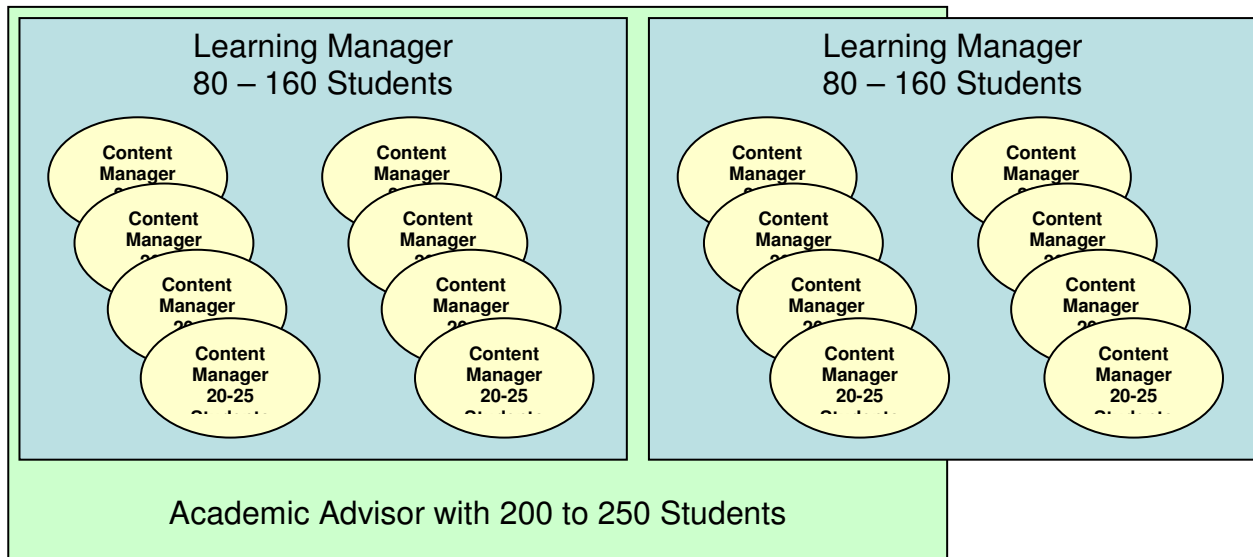


Figure 4. *Example of Student Support within Proposed Model*

Course Timeline

Each fiscal year would consist of five semesters with July and December being system update months. (see Table 5) Semesters would consist of eight weeks each including final examinations, and would begin with the Fall semester. The following is a tentative schedule of the first year of implementation.

Table 5.
Example of 8-Week Course Period

Semester	Fall I	Fall II	Spring I	Spring II	Summer
Beginning	First of August	First of October	First of January	First of March	First of May
Ending	First of October	First of December	First of March	First of May	First of July

(Schedule reflects one month off in December and one month off in July)

Student Interaction

During the implementation and continuation phases, students would have direct access to three human resources; the Learning Manager, the Content Integrator, and their assigned Academic Advisor. Though the Learning Manager would not be the primary contact s/he would be available to make major decisions required to promote student success within the course. The Content Integrator would be the student's direct point of contact. Students concerned with course materials, concept chunks or assignments would contact the Content Integrator. The Academic Advisor would serve as a liaison for all concerned and communicate with the Learning Manager about student concerns and curriculum improvement recommendations. Students with concerns or questions affecting them personally could contact the Academic Advisor. Figure 5 notes the approximate student contact and interaction percentages.

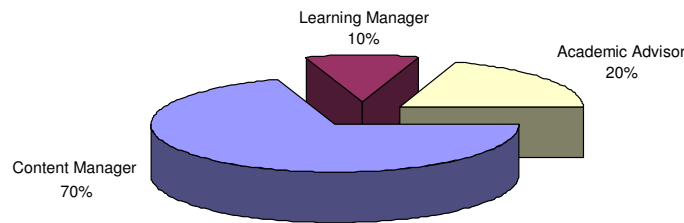


Figure 5. *Approximate Percentage of Student Interaction with Course Personnel*

Summary and Conclusions

This paper provides an overview of a framework to develop 40 undergraduate courses to support the undergraduate DE program in the College of Technology and Computer Science incorporating best practices into the development of these courses in order to avoid impeding innovation in Web-based learning and meet the highest standard with in courses .¹⁰ As stated, the B.S.I.T. program is a 2+2 undergraduate program aligning with AAS degree of the NCCCS and providing high-quality content. The learning module design paradigm as it addresses the growing demand through the scalability inherent in the proposed model, is a framework which will address innovation and embrace anytime, anywhere, any pace learning.

Once developed, these modules will be used to create other offerings for specific target markets within North Carolina and outside the state. Additionally, these cost projections presented to upper administration did not consider the positive impact that out-of-state students would have on annual budget processes. Even with these caveats, the initial analysis establishes a strong basis to justify the investment in terms of return to the State of North Carolina. Meeting specific goals and objectives of the University of North Carolina System, including: long-range economic returns, workforce development, and increasing partnerships with the North Carolina Community College System will be achieved by implementing fully the plans described in this project.

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