ED ABSTRACT - Indiana's Proposal for a Program of Study In Supply Chain Logistics Management

Indiana has long been recognized for its state motto: "The Crossroads of America." Manufacturing and logistics are the foundation of Indiana's economy. According to a May 5, 2008 report on Inside Indiana Business, "The advanced manufacturing, transportation, distribution and logistics industries are at the forefront of the state's economic efforts. Recruiting and retaining a highly talented workforce is essential to expanding the already strong economic impact and growth potential."

Indiana has had much success in creating Programs of Study. We are now working on a prototype for a successful Program of Study in Supply Chain Logistics Management in the Transportation, Distribution, and Logistics cluster. It incorporates strong academic skills, technical skills and 21st Century skills in a pathway from middle school through postsecondary. The new Program of Study will also help students seamlessly transition to two and four-year programs and certifications in a growing career field. This area was chosen for several reasons. One was the growing demand for these skills in manufacturing, business, and the military. Another was the recent addition of several of these programs at the postsecondary level and the demand for these students in the workforce. A third reason is that the additional integration of contextual math examples will help many students develop skills that will allow them to enter and succeed at the postsecondary level, since math is the biggest obstacle to entry.

This program has grown at the postsecondary level to include eight institutions, including Ivy Tech Community College with 23 separate statewide facilities several that are within two years old. In fact, the Ivy Tech Community College campus in Gary, IN was just awarded $850,000 in federal funds on June 26, 2008 to create a new Center on Logistics, Distribution and Transportation. The need in the workforce is growing. The prototype is just beginning at the secondary level with two schools involved and several others expressing interest. We are in need of more secondary students with the knowledge and skills to feed into these postsecondary programs.

Our first year partners include IN Workforce Development, IN Department of Education, MSD Lawrence Township, The University of Indianapolis, Ivy Tech Community College, Vincennes University, APICS, Conexus Indiana and Immi. Purdue University, IUPUI, ISU, and Ball State University will be included in year two.

The biggest policy issue is the cost of dual credit courses taken at the postsecondary level. We have Early College High School precedents that will help us in this resolving this issue.

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(a.) Project Design

Indiana is a leader in creating partnerships to help design and replicate rigorous CTE Programs of Study and developing statewide articulation agreements. A dedicated partnership has begun work on our newest Program of Study in Supply Chain Logistics Management. Supply Chain Logistics Management is a growing field that is an integral part of Indiana's economic growth. It is strongly linked with manufacturing as materials need to be gathered, assembled and shipped during the manufacturing process. Supply chain management integrates internal and external logistics across many manufacturers, distributors, suppliers, retailers, transportation providers and third party logistics firms to increase productivity and obtain a competitive edge. The increased speed and dependability of transportation and information flow has led to the globalization of business, and supply chain management techniques are also applicable to international manufacturing logistics. The global economy will continue to create the need for more employees with SCLM skills. According to the Indianapolis Business Journal (O'Malley 2005), the average wage for a worker in the area of supply chain management and logistics is $39,931, 42% higher than the state average wage of $28,032. Salaries for management jobs in the field are upwards of $50,000.

The transportation, distribution and logistics sector is a $1 trillion industry in the United States and expected to grow 65% by 2020. Indiana is in an excellent position to take advantage of the tremendous economic development opportunities within this industry. Our goal is three fold: to get more students interested in the growing Supply Chain Logistics Management (SCLM) field, to help students better understand the use of math as a tool in solving problems by embedding

real-world SCLM math examples into both math and CTE courses, and to help students seamlessly transition from high school into SCLM postsecondary options and the workforce.

Indiana has an excellent track record of working together in partnership with related institutions to create innovative educational pathways for students that help them transition from secondary to postsecondary education. The Indiana Department of Workforce Development (IDWD), in partnership with the Indiana Department of Education (IDOE) and Purdue University (PU) have created a Program of Study in pre-engineering through the Project Lead the Way (PLTW) program that will include over 300 middle and high schools and over 30,000 students in Indiana next year. Ivy Tech Community College awards statewide dual credit at its 23 campuses for several of these courses as does Purdue University's College of Technology and several other universities in Indiana. Indiana University Purdue University at Indianapolis (IUPUI) offers nationwide dual credit for several of the courses.

These same entities have also created a Program of Study in Agricultural/Advanced Life Sciences that includes three Career and Technical Education (CTE) courses that count as a CTE course, an academic science class and dual credits at Purdue.

A partnership between IDWD, Indiana University and IDOE has launched a new PLTW program in Biomedical Sciences that will evolve into a new Program of Study for Health Sciences. Work has begun to start the process for getting science credit for this course as well. Nearly 50 high schools will be involved this initiative next year. All three initiatives include significant professional development, contextual or problem-based learning, rigorous CTE and academic

standards and dual credit and/or articulation agreements when appropriate. All three are successful and growing and we are able to take our lessons learned into a new high need area, Supply Chain Logistics Management.

Indiana has had four key areas for economic development for the past eight years.

They are: Life Sciences,

Advanced Manufacturing,

Information Technology, and

Transportation, Distribution and Logistics.

Indiana has fully developed Programs of Study for two of these four areas- Advanced Manufacturing (Project Lead the Way and Manufacturing Skill Standards Council (MSSC) certifications) and Life Sciences (Advanced Life Sciences). We also have many excellent certification programs for Information Technology. Indiana needs a workforce pipeline of mathematically talented students that have some understanding of the Transportation, Distribution, and Logistics field and the multitude of opportunities that exist within this career area. Our first Program of Study in this area will be Supply Chain Logistics Management.

Indiana is in the beginning stages of creating a fully developed Program of Study that uses Supply Chain Logistics Management to help students better understand how math concepts are used in the real world and introduce students to the rapidly growing field of distribution, logistics and supply chain management. Math is the unifying discipline underlying science, engineering, business and technology on which supply chain management is built. Most basic math skills can

be taught using supply chain concepts. The majority of students better understand math concepts when presented in a real world scenario like logistics or supply chain management.

Supply Chain Logistics Management cuts across several career cluster areas. It is a math intensive business strategy that is used in manufacturing and TDL. Computer Science is also needed for effective SCLM. The Program of Study will include math courses using distribution and logistics examples along with a series of CTE business courses, Computer Science courses and Computer Integrated Manufacturing (CIM) courses, also embedded with logistics examples. New courses will not be created as it is increasingly hard for students to fit more courses into their schedules. Instead, we will be embedding the SCLM concepts into courses that can serve dual purposes. The integrated math courses will count as one of the required math courses as well as a SCLM Program of Study course. Initially, the other integrated courses in the high school sequence will come from the business side – finance, marketing and entrepreneurship. They too can be used as part of a business sequence or part of the SCLM Program of Study. Later work will include integration of theses concepts into the Computer Sciences courses such as A+ and Net +, and CIM courses.

The partners involved have been working together for two years creating the pieces of this new program. A standards-based book of Supply Chain Management/TDL math modules has been created during this time. Several schools in the Indianapolis area have been using these math modules to teach Algebra concepts for the past two years. Students seem to understand the math concepts much better when taught in context. The effectiveness of this approach will measured using standardized math tests such the End of Course Assessments for Algebra I & II.

The project will be carried out using a partnership between IDWD, IDOE, Vincennes University, Ivy Tech Community College, University of Indianapolis, and the Indiana Commission for Higher Education, McKenzie Career Center and several industry partners and organizations.

The **Indiana Department of Workforce Development (IDWD)** is responsible for federal Perkins funding with a goal of increasing the skills of our emerging workforce by developing pathways to postsecondary institutions. It is also the state's workforce agency. IDWD has been working on creating seamless pathways from high school to postsecondary institutions since 1999 with the Pathways to Postsecondary- Indiana Career Majors initiative. The initiative was featured in the January 2007 issue of Techniques Magazine in an article written by Terri Schulz. Ms. Schulz has been working on the TDL Program of Study since the beginning and has pulled together the partners to move toward statewide articulation. Christopher Guidry, Indiana's Director for Career and Technical Education (CTE), will also be working with the project. Mr. Guidry reports to Marty Morrow, the Chief Operating Officer of IDWD. IDWD has provided seed money, technical assistance and joint planning meetings for high schools and postsecondary partners to create rigorous CTE Programs of Study. We have held six two-day facilitated strategic planning events for high schools, postsecondary partners and business partners to help in this process. The role of IDWD in this project will remain the same. They will bring together the various partners for planning purposes and provide additional seed money for the project. Christopher Guidry, the Director of Career and Technical Education for IDWD will be the contact for this grant.

The **Indiana Department of Education (IDOE)** is responsible for K-12 education and for CTE state funding. IDOE has specialists who work in each of the career cluster areas. They have developed a Career Cluster grid that encompasses the 16 Career Clusters and 80 High School Career Pathway Plans of Study within the 16 clusters. The new Logistics/Supply Chain Management Program of Study is not yet listed on the grid as it is still in development. The creation of this Program of Study will involve academic consultants as well as Career and Technical Education consultants in business, manufacturing and TDL. IDOE consultants will work with the project to help align academic standards in the courses with Algebra and Algebra II standards. IDOE will also complete end of courses assessments for the CTE high school courses to help validate knowledge learned for articulation agreements and dual credit. APICS (American Production and Inventory Control Society) Certification standards will be embedded into the high school course sequence and students will be expected to pass at least one module of this certification prior to high school graduation. Patty Shutt, the Director of Career and Technical Education for the Department of Education is working directly on this project along with the related CTE consultants. In addition, Dorothy Winchester, the Director for Curriculum and Instruction is interested in creating an applied math course that can be used as a math credit. Ms. Winchester and her Assistant Director, Mike Roach, will be instrumental in helping create a math course with rigorous standards that will be taught using logistics and supply chain management as the context for learning math concepts. Mr. Roach was the Department's math consultant prior to taking the assistant director position. Both Ms. Winchester and Ms. Shutt report directly to Phyllis Usher, Assistant Superintendent for Curriculum and Instructional Leadership. Patty Shutt, the Director of Career and Technical Education for the IDOE will be the contact for this project.

The **Indiana Commission for Higher Education (ICHE)** is responsible for coordinating activities at Indiana's two-year and four-year postsecondary institutions. The Commission sets guidelines for awarding dual credit and the transfer of credit between institutions. The have developed a Core Transfer Library in which any course listed has been approved for dual credit and complete transferability between any Indiana public postsecondary institution. More information can be found on the Transfer IN.net website at http://www.transferin.net/Pages/Home.aspx . Integrated courses that have the rigor of a college classes will be submitted for approval through the Core Transfer Library. College courses can be submitted for complete transferability between all state public postsecondary institutions. Cheryl Orr, Associate Commissioner of Communications and P-16 Programs and Planning for ICHE is the contact for this grant.

McKenzie Career Center (MCC) is the first school to develop a Supply Chain Academy and has served as the model for this program of study at the high school level. Students in the Supply Chain Academy take math courses integrated with real-world logistics examples and business courses with logistics math examples. McKenzie also hosts the Young Executive Camp for middle school students and is working on including two dual credit courses taken at the University of Indianapolis in their SCLM program. They currently have student taking dual credit courses at the University of Indianapolis in their Finance Academy. Several other Indianapolis area students participate in this dual credit opportunity as well under an Indianapolis area Academy of Finance Partnership Team. At least one of the curriculum writers for the secondary program will be from McKenzie. Carletta Sullivan, School-to-Work Coordinator for McKenzie Career Center will be the contact for this grant.

The **University of Indianapolis (UINDY)** has been a key player in the new Program of Study in Logistics/Supply Chain Management. The University offers a four year degree in Supply Chain Management. Dr. Leslie Gardner, a Professor of Operations Management at the University of Indianapolis has been working with high school teachers for two years to teach math lessons using the context of logistics and supply chain management. Dr. Gardner has a joint appointment to the College of Business and the College of Mathematics and is certified in Production and Inventory Management (CPIM) by the American Production and Inventory Control Society (APICS). She also has taught high school mathematics and chemistry and has an Indiana teacher's license. Dr. Gardner has created a series of lesson plans with the help of high school math teacher that can be disseminated and shared with others. She has been team teaching these lessons with Algebra and Algebra II teachers at several Indiana schools. She plans to start a two-week summer professional development workshop for teachers next summer.

Dr. Gardner has been asked by Conexus Indiana to submit a proposal for the summer program to teach math teachers how to use the logistics/supply chain management math modules in the classroom. Conexus Indiana is the state's advanced manufacturing and logistic initiative, dedicated to making Indiana a global leader in these high-growth, high tech industries. While funding has not yet been approved for next year's workshop, it is highly anticipated that funding will be available through Conexus for this professional development next summer.

Dr. Gardner also organizes a week long summer "Young Executive Camp" for the past two years for middle school students to introduce the concepts of supply chain management and how it is used in manufacturing. The camp includes a trip to a Biomedical manufacturing facility (Roche

Diagnostics), a field trip to FedEx for distribution, logistics and supply chain management facility and computer simulations of running a network of convenience stores.

Plans are being finalized for two dual credit courses for high school students to be taken by area students at the UIndy. This is an effective model that has been in use for nearly five years in the College of Business with students from high schools with Finance Academies. One of the courses will be a Finite Math course and the other will be Principles of Operations and Supply Chain Management. The Finite Math course will be submitted to the Core Transfer Library for dual credit at any Indiana postsecondary institution. Dr. Gardner is the contact for this grant at the University of Indianapolis.

Vincennes University (VU) is one of Indiana's two community college systems. Vincennes is a partner in the distribution/logistics/supply chain management area for the southwestern part of the state. They currently have a new two-year Associate of Science degree program in Supply Chain Logistics Management that has transferability into the University of Indianapolis Bachelor of Arts or Science degree in Supply Chain Management. The contact for Vincennes University is Dr. Carolyn Jones, Director of Curriculum and Accreditation at Vincennes University.

Ivy Tech Community College (ITCC) system has 23 statewide campuses. Ivy Tech has two degrees in TDL. One is an Associate of Science in Transportation, Distribution and Logistics and the other is an Associate of Science in Business Administration with a Logistics Concentration. They also have a certification program. Alignment of this program with the high school program and four year programs will be included in this scope of work. The contacts at Ivy Tech

Community College are Marnia Kennon, Vice Provost for Academic Affairs and Sherman Johnson, Executive Director Indianapolis Workforce and Economic Development.

The Association for Operations Management – Advancing Productivity, Innovation and Competitive Success (APICS) is a key partner is this initiative. Jason Wheeler is the President of the Central Indiana Chapter of APICS. Mr. Wheeler has been an integral part of the SCLM partnership team and will be instrumental in aligning curricular content at both the secondary and postsecondary level with industry needs. He will also help place students in industry positions upon successful completion of the program and help align internships for teachers and students.

IMMI develops, markets and manufactures quality safety systems for heavy trucks, off-highway vehicles, child seating, emergency vehicles and outdoor industries. IMMI is one of the largest employers in Hamilton County, employing over 700 employees in their Westfield Headquarters, with about 500 of them involved in manufacturing, purchasing, logistics and supply chain management. Steve Wallen, the Director of Operation at IMMI, has been involved in the Young Executive Camp at McKenzie. He will give industry input to the development of the curriculum and courses in the program of study in SCLM.

Parish Manufacturing is an Indianapolis Manufacturer of custom bag in box products for the food service industry. Dan Cunningham, Chief Operating Officer for Parrish Manufacturing is on the Advisory Board for both the Supply Chain Academy at McKenzie and for the college of Technology Program in Operations Industrial Distribution at Purdue. Mr. Cunningham's expertise will be extremely valuable in aligning this SCLM Program of Study.

All partners listed in this grant have been working on pieces of this program of study and are committed to continuing this work under this grant. The business partners have a need for knowledgeable students that are interested in distribution/logistics and supply chain management. All have agreed to support the initiative with time and talent. The work that needs to be done to complete this Program of Study is people intensive. At the secondary level, representatives from the secondary schools and postsecondary partners will continue work on integrating SCLM concepts into both high school math and related CTE courses in business, Computer Sciences and CIM. An End of Program Assessment aligned with programs at the postsecondary level will be created. They will also create summer training for secondary teachers in both math and CTE courses related to Supply Chain Logistics Management. APICS standards will be sued to align learning outcomes. Our goal is to have a stand alone career center, a high school with an attached career center and a stand alone high school involved in this project. Three models will be developed that can shared with the various configurations of CTE high school programs. The school sites have been identified and have expressed interest and support for this program.

At the postsecondary level, work will revolve around aligning the curriculum with each partner institution, refining courses when needed for alignment, creating a statewide articulation agreement, and aligning the curriculum with the needs of business and industry. The business representatives and partners will be included in responsible for vetting the curriculum to be sure concepts and methodology is at industry standard, support the initiative through resources such internships for students and teachers, guest speakers, etc.

(b.) Technical Approach

The Program of Study in SCLM incorporates rigorous academic standards and challenging technical content. One innovative piece of this Program of Study is that it does not include a new set of courses. At the secondary level, it is harder and harder for students to add more courses into their schedule and still graduate, especially for students aspiring to an Honors Diploma. This POS will allow students to take at least one or two courses that will fulfill a foundation course requirement –Algebra I & Algebra II.

Math is the basis for occupations in Supply Chain Logistics Management and good math students will thrive in this career area. In this sequence, math courses will be integrated with real world applications and still count as an Algebra I or Algebra II class as all algebra standards will have been met. Many students would be exposed to SCLM while getting a regular math credit who may have never considered a career in SCLM because they did not know what it was. Many of the lesson plans for Algebra I and Algebra II have been developed over the last two years and all are standards based. Students are better able to comprehend how an algebra equation is used when they can use it to solve an actual problem in SCLM. In addition, the IDOE is interested in creating an upper level math course that is application based. Preliminary discussions indicate SCLM curriculum examples could be foundation for the course. IDOE has had success in having application based science courses approved for science credit. Current plans call for the development of this upper level college prep course that could be used to upgrade student math skills through real-world SCLM examples.

Starting with the Class of 2012 (incoming freshmen), students in Indiana must complete an End of Course Assessment (ECA) in Algebra I, Biology and English in order to graduate. Students in the SCLM pathway would not only be exposed to math examples in algebra class, they would also be included in business, marketing, entrepreneurship, computer science and CIM courses as well. Also, students who have failed the End of Course Assessment in Algebra could take this course instead of retaking the traditional Algebra I course with the intent of increasing understanding of Algebraic concepts and how they are used so they will have a better chance of passing the Algebra ECA Graduation Requirement the next time. Technical courses such as business, marketing, entrepreneurship, Computer Sciences and CIM will be integrated with math and reading/ language arts as well as SCLM concepts. These courses can be utilized as business courses in a business sequence, computer science sequence, and manufacturing sequence or in the SCLM pathway.

The courses listed in the secondary sequence currently include:

Year in School	Mathematics	SCLM/Business Courses
Freshman	Algebra I	Career Exploration and Business Foundations
Sophomore	Algebra II & Geometry	Marketing Foundations & Finance
Junior	Pre-Calculus	Entrepreneurship and Internship in Supply Chain
Senior	Finite Math at UIndy	Operations & Supply Chain at U of I

Plans include adding SCLM courses in Computer Sciences and Computer -Aided Manufacturing. An End of Program Assessment would be developed that would include six or more transferable dual credits. Students would also be certified in at least one of the APICS certification areas.

Currently, there are nine standards-based math lessons and five standards-based marketing and entrepreneurship lessons developed, with ideas to develop several more. Work would also revolve around the need to integrate with Project Lead the Way pre-engineering and Dream It Do It. Some schools may want to integrate with sciences or economics. In addition, several students will have opportunities to participate in paid internships as part of this Program of Study. The partnership team will help increase the number of internships available for SCLM students and standardize learning outcomes from the internship experience.

After graduation, students would have the ability to move into various seamless postsecondary options. All would be aligned for credit transferability. They could choose to get an Associate Degree, Bachelors Degree and/or a certification. And they can choose to get an Associate Degree and then move on to a Bachelor's Degree without losing any credits. Currently, a student getting an Associate Degree in Supply Chain Logistics Management at Vincennes University can transfer all the credits to the UIndy toward a Bachelors of Arts or Sciences in Operations and Supply Chain Management. At the conclusion of this grant, students will have the option of taking courses at one of the 23 Ivy Tech Community College campuses as well with transferable credits. Credits from both of the two-year institutions will also have transferability with the UIndy, Purdue-West Lafayette and any of the other Purdue campuses that have the Industrial Distribution degree program. The SCLM Program of Study will also include Production and Inventory Management (CPIM) certification by the American Production and Inventory Control Society (APICS) with the goal of having students fully CPIM certified at the conclusion of the Bachelors degree.

Plans are being finalized for the option of having students take two courses from the UIndy for dual credit; Finite Math and Principles of Operations and Supply Chain Management. Indianapolis area students would be the main beneficiary but work will be done to check the feasibility of offering the course by distance learning as well. The model for this course was created for students in the Academy of Finance. The UIndy has had high school students taking dual credit classes on its campus for several years through this program. In addition, the Finite Math course is being reviewed for course equivalency on the Core Transfer Library. When course equivalency is granted, the credits will be transferable to any postsecondary degree program in Indiana.

This initiative for creating articulation agreements and a SCLM Program of Study makes use of several effective practices. They include:

- creation of an integrated standards-based curriculum and assessments,
- project or problem-based learning using real-world context,
- effective professional development for teachers and counselors,
- career information and skills enhancement for students,
- postsecondary and industry involvement in curriculum writing,
- curriculum mapping between secondary teachers and postsecondary faculty,
- end of course and end of program assessments developed by all educational levels,
- seamless transition for students through all levels of education, and
- continuous improvement.

These practices have been effective in developing other programs of study. Effective, problem-based learning effectively integrates math, reading, writing and important 21st Century Skills such as teamwork, problem solving, critical thinking, and oral communication skills. The curriculum must be rigorous and standards-based at the appropriate level. Effective professional development for teachers must be included. Counselors are the gate keepers for course taking and must be included in the process. Curriculum must be aligned with industry standards and certifications as well as with postsecondary institutions. Secondary teachers and postsecondary faculty from two year and four year institutions must work together to align learning outcomes and develop effective curriculum and assessments, including end of course and end of program assessments. The curriculum and assessments must be reviewed on a regular basis, approximately every three years, to assure proper alignment between all levels of education to the workforce. Another effective practice is to engage middle school students in career activities through outreach activities such as the Young Executive Camp.

The goal of this new Program of Study is to get more students interested in SCLM and successfully complete two and four year degree programs in SCLM or related fields. To do this, students need to better understand the field of SCLM and be better prepared for postsecondary math courses.

The following timeline will be used to accomplish the required activities.

Strategy	Responsible Parties	Date	Outcome
Curriculum development and assessments	Project Director and curriculum writers, IDOE	Ongoing	Ongoing- 17 are completed
Dual Credit classes at U of I	Project Director, teachers	Spring 2009	Start of classes
Counselor Sessions	Project Director and curriculum writers, IDOE	Spring 2009	# counselors attending
Teacher Training	Project Director, teachers, partnership team	Summer 2009	# trained & student outcomes
Career Info and Skills Enhancement	Project Director and teachers, partnership team	Ongoing	Informational materials
Curriculum mapping	Project Director and postsecondary faculty	Summer 2008	Dual Credit & articulation
Curriculum refinement	Project Director and postsecondary faculty	Summer 2008	Dual Credit & articulation
End of Course and End of Program Assessments	Project Director and educators at all levels, partnership team	Summer 2008	Statewide Articulation agreement
Continuous Improvement	Project Director and educators at all levels, partnership team	Ongoing	Increasing # of students in POS

(c.) Project Management

Dr. Leslie Gardner, Professor of Operations Management and Mathematics at UIndy will serve as the Project Director for this project. Dr. Gardner has a Doctorate in Industrial Engineering and is certified in Production and Inventory Management (CPIM) by American Production and Inventory Control Society (APICS). She also holds an Indiana Teaching License in Physics and Mathematics and has taught math classes at the middle school and high school level. She has co-created a summer supply chain middle school camp which has just completed the second successful year of operation. Dr. Gardner is a prolific author with numerous published articles, generally on Supply Chain Logistics Management and/or innovative teaching methodologies. An article about the camp called "Recruiting the Supply Chain Professionals of the Future: A Supply Chain Camp for Middle School Students will appear in an upcoming edition of the *Decision Sciences Journal of Innovative Education.* She also has given numerous presentations on her work in this area including:

- *Indiana is Positioned for an Economic Miracle-Starting in High School Algebra Classrooms,*
- *Is Mathematics Profitable? Activities that Connect Math to High Paying Careers,*
- *Supply Chain Management,*
- *Why Students Should Write,* and
- *Writing Across the Disciplines for Learning Excellence.*

Dr. Gardner has been team teaching the SCLM concepts with high school teachers in the Indianapolis area for several years and works directly with the teachers to create integrated

lesson plans. The lesson plans reinforce math and language arts standards which help with No Child Left Behind (NCLB) and Indiana graduation required testing. They also contain relevant, real-world examples which are engaging to students and an introduction into the field of Supply Chain Logistics Management, a rapidly growing occupational area. Dr. Gardner will devote 40% of her time on this project during the academic year and 100% of her time in the summer.

The plan for managing the project revolves around three core areas.

1. **Refining the high school modules already created, developing more modules and developing the assessments for both the existing modules and new modules.**

   Three high school teachers will work directly with Dr. Gardner to develop the new modules. The curriculum group has met with the UIndy Professor in Math Education on testing the modules for effectiveness (pre and post tests, experimental and control sections of classes for testing, etc.). The modules would be revised and tested based on the effectiveness studies. Research on student achievement for passing the Algebra I and Algebra II End of Course Assessments and the math scores and acceptance rates for students entering postsecondary institutions. In addition, new math modules and SCLM modules will be developed for Geometry, Information Technology and manufacturing courses. This would be ongoing over the two years of this project period.

2. **Creating a Professional Development system for training high school teachers on effective use of the modules.**

Professional development would be based on a one to two week summer training program. A two week training session is already scheduled for next summer. Training sessions for teacher in-service days would also be included. Teachers will be able to receive Continuing Education Units (CEU's) or graduate credit for the training sessions. A proposal for a two-week professional development session has been submitted for funding (by request) to Conexus Indiana. Highlights of the proposed teacher training are listed below. In addition, guest luncheon speakers have been scheduled for each day but excluded here to conserve space.

Schedule – Week 1

Day 1

- Team assignments – teams of 3-4 for activities, grouped by teaching field
- What is supply chain management?
- Introduction to manufacturing
  - Design of processes – introduction to PERT/CPM and line balancing
  - Simple time and motion concepts
- Team building activity – make a no bake dessert that uses branched steps
  - Time activities
  - Develop PERT/CPM diagram
  - Create and balance assembly line -Products become dessert for lunch

- Introduction to JIT and flow of materials
- Brainstorming of ideas for math lessons to be taught in the context of manufacturing.
- Teachers work in teams to design manufacturing based lessons to be presented on Day 3
- Lessons must adhere to Indiana Standards for math, language arts and CTE

Day 2

- Field trip to Nucor steel mill. Team lesson planning on bus to and from field trip
- Continued lesson planning – development of The following:
    - lesson plans, rubrics, problem sets, activities, work sheets, visuals (power points)

Day 3

- Field trip to assembly plant -Emphasis on material flow and technology
- Teams teach their manufacturing lesson to the rest of the group
- Discussion and critique of lessons

Day 4

- Introduction to transportation, distribution and logistics
    - Why important to Indiana
    - Introduction to foreign trade zones and global trade issues
    - Presentations by several TDL guest speakers (Ports of Indiana, 3PL, FedEx etc.)
- Introduction to mathematics of RFID and bar coding

Day 5

- Introduction to packaging (Caesar Watkins and Dan Cunningham)
- Packaging lab – teams make boxes and other packages
- Field trip to Redcats

Schedule – Week 2

Day 1

- Supply Chains and the Bullwhip Effect
  - Beer Distribution Game & Online supply chain simulations
- Begin development of TDL lesson plans

Day 2

- Field trip to FedEx
- Continued lesson planning – development of lesson plans, rubrics, problem sets, etc.

Day 3

- Teams teach their TDL lesson to the rest of the group
- Discussion and critique of lessons
- Career ladders & Panel discussion of HR directors from various companies

Day 4

- Introduction to quality and quality tools
- Process improvement lab done in teams to improve this workshop
- Field trip to Roche to see visible quality processes such as the glucose meter test

Day 5

- Disseminate lesson plans, worksheets, and instructional modules
- Individual teachers or groups develop plans to implement modules for their courses
- Presentation of implementation plans & Wrap up

3. **Curriculum alignment (and development when necessary) through all the levels of the Program of Study including secondary, two and four year state postsecondary institutions and APICS.**

Indiana has an excellent start in the alignment of the SCLM Program of Study. The biggest success to date has been the alignment and transferability of credits of the Associate of Science program in SCLM at Vincennes University with and the UIndy Bachelors of Arts or Sciences in Operations and Supply Chain Management programs. There also has been some work done in alignment between the secondary programs and postsecondary programs but not yet at a statewide level. The next steps involve:

- getting one or more courses in the POS at the secondary level to be approved for statewide dual credit on the Core Transfer Library,
- the start up of two courses for secondary students at the UIndy for dual credit,
- completing the process for transferability to and from the Ivy Tech Community College system, and
- aligning both of the Associate Degree programs with Indiana's four year postsecondary institutions including Purdue University (PU), Indiana University Purdue University at Indianapolis (IUPUI), Ball State University (BSU) and the UIndy.

The grant partners will initially focus on the alignment of the two-year institutions and the secondary schools, while keeping alignment issues and concerns with four year institutions in mind. The core work of aligning the two year program with the four year institutions will be the focus of the second year. Both alignment goals involve the development of an End of Program

Assessment that can be used to insure quality, alignment and dual credit for secondary students as they transition to postsecondary. The process will follow along the same protocol as was used for the Vincennes University and UIndy alignment.

Plans are underway to offer two dual credit, concurrent enrollment courses at the UIndy next spring. We will also look at ways to allow students outside the Indianapolis area to participate either through distance learning or allowing other institution around the state to offer the courses.

(d.) Dissemination

(1) The strategies used to create this POS can be easily disseminated. A description of the procedure used to develop materials and align courses for statewide articulation will be shared nationally. Dr. Gardner and several of the teachers and industry partners have been presenting on this program several times at various statewide math and logistics conferences. Dr. Gardner also presents nationally on a regular basis. They will continue to present in Indiana and nationally as the program grows and progresses.

(2) Indiana already has several resources that can be shared immediately and many others that can be shared upon the conclusion of the grant. The nine problem-based SCLM math lesson plans are in a bound packet that can easily be shared. They are already being shared with Indiana educators. These lesson plans are available at any time upon request. The end of course assessments and end of program assessments that will be developed under this grant can also be disseminated as well as the Teacher Training materials that are being created. A description of

the procedure used to develop materials and align courses for statewide articulation can be shared on a national level. Dr. Gardner and several of the teachers and industry partners have been presenting on this program several times at various conferences.

Other items that can be shared include the protocol for aligning programs at the two year institutions with four year institutions and the protocol for having secondary students take college courses at a two-year or four-year institutions.

(e.) Adequacy of Resources

The majority of the funds needed for completing this Program of Study include buying staff time at both the secondary and postsecondary levels for integrating and aligning courses from secondary through two year and four year degrees and certifications. Funds will also be used to create more of the standards based math lesson for the various math classes and for the business, marketing, entrepreneurship, finance, computer science and Computer-Integrated Manufacturing courses. Travel to state and national logistics conferences for the Project Director and other partners are also included. The Indiana Department of Workforce Development has awarded two grants totaling $52,000 to McKenzie Career Center to support the establishment of this Academy. The expenses listed in this proposal are adequate and reasonable in relationship to the technical approach and significance of this project.

BUDGET

Category	Grant Funds	Matching Funds	Total
Administration	$6200	0	$6200
Contracted Services • Project Director • Curriculum Writers • Stipends for course alignment and rewriting • Substitute teachers • APICS Certification Module Teacher kit	 $83,210 0 $25,000 $ 500 $1,000	 $18,000 $12,000	$139,710
Materials and Supplies • Curriculum modules • Assessments	 $2590	 $7,500	$10,090
Travel • **Indiana Logistics Summit** • **ICTM** • **Marketing/Ent. Conf.** • **(2) National SCM Conf.**	$6,500		$6,500
Total	$ 125,000	$ 37,500	$162,500

Budget Narrative for Grant Funds

Administration		$ 6,200
Contract Services		$ 139,210
• Project Director- Dr. Leslie Gardner	$ 83,210	
40% of time during spring and fall semesters		
100% of summer		
• Stipends for 3 teachers @ $100/day for 60 days	$ 18,000	
• Substitute Teachers Costs 5 days @ $100 day	$ 500	
• Stipends for postsecondary planning $250/day x 100 days	$ 25,000	
• APICS Certification module	$ 1,000	
Materials and Supplies		$2,590
• Costs of printing/binding curriculum Curriculum modules and assessments		
Travel		$6,500
• Registration fees for		

- National SCM Conferences (3) $1200
- Indiana Logistics Summit (3) $ 750
- ICTM & BME Conference (3) $ 200

Airfare

- 3 at $600 $1,800
- Per diem
  - out of state (3 x 3 days @ $32.00) $ 288
  - in state (6 x 2 days @ $26.00) $ 312

Hotels

- out of state (6 x $180) $1,080
- in state (6 x $100) $ 600

Mileage

- 400 miles @.44 $ 176

Misc. Travel/Parking $ 94

TOTAL $125,000