



Curriculum Integration In Context:

An Exploration
Of How Structures
And Circumstances
Affect Design and
Implementation

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Affect Design and Implementation

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Executive Summary

As part of its work as an associate partner in the National Research Center for Career and Technical Education, the Academy for Educational Development, National Institute for Work and Learning (NIWL) undertook a study of curriculum integration models in order to assess the quality of integration-related reforms at the classroom level, and document best practices for promoting desired student outcomes. This report provides the findings from this study.

Methods

In order to obtain firsthand information about different approaches and strategies for curriculum integration, case studies of curriculum integration models were conducted in seven sites across the United States. Teams of researchers spent 3 to 4 days in each of the seven communities observing activities, and conducting individual and group interviews and focus groups with school administrators, teachers, guidance counselors, employers, parents, students, and representatives from participating postsecondary institutions. Teams also conducted extensive reviews of existing documents in order to understand the nature and history of each initiative. Prior to the site visits, teams looked at local evaluation and communications materials, mission statements, organizational charts, and community demographic information for each site. After the site visits, the teams reviewed additional documents collected on site including meeting minutes, program reports, curriculum samples, and, where possible, data describing or assessing the impacts of curriculum integration on students.

The project began with an exploration of the relationship between the driver, or catalyst, of a particular curriculum integration effort, and the scope and quality of that effort in four sites. For the purposes of initial research, curriculum integration was defined as *a relationship between academic and occupational or career-technical subject matter that goes beyond what would normally occur in the delivery of either the academic or occupational/career-technical subject matter alone*. The four models visited during Phase I of the study were selected primarily based on the identity of the catalyst or driver (employer, university, high school teachers, and multiple catalysts). Programs or initiatives also needed to be sophisticated and of high quality.

After analyzing the information collected during the first round of site visits, the team concluded that the catalyst's role in determining the scope and quality of curriculum integration did not extend much beyond its initial influence on the context. While the catalyst facilitated initial efforts to develop curriculum integration, success was ultimately determined by the presence of strong and consistent leadership throughout the design and implementation phases. Sometimes, but not always, leadership rested in the hands of the original driver or catalyst.

Year 1 findings also suggested that the original working definition was overly broad, which caused the NIWL team to rethink and more clearly define its notion of curriculum integration. For the second phase of the study, curriculum integration was defined as *a series of conscious and informed strategies used to connect academic and vocational content so that one becomes a platform for instruction in the other over an extended period of time*. For the second phase, the

team revised its site selection criteria, and set out to identify three additional curriculum integration models that met the requirements outlined in the new definition.

Findings

Based on findings from this study, it is clear that the presence or lack of certain contextual factors related to structure and operations has considerable implications for the shape, scope, and quality of curriculum integration. The context affects the nature of barriers or challenges school staff face in developing and implementing new content or instructional strategies, which has a direct bearing on outcomes. Specifically:

- Curriculum integration appears to become more difficult in settings that are focused on multiple occupational areas, as opposed to a single industry, theme, or pathway.
- Curriculum integration appears to be more effective when both academic and vocational instruction occur at the same site. Practitioners seem to have considerable difficulty in supporting curriculum integration when students receive regular academic instruction in one location and vocational instruction at another location.
- Curriculum integration is a particular challenge for vocational high schools, career programs, and regional tech centers that offer career and technical education to students from multiple high schools or districts.
- The presence of leadership at all levels—district, building, and classroom—contributes to developing, implementing, and sustaining successful curriculum integration efforts. In order for curriculum integration efforts to be effective, individuals in leadership roles must be innovative, adaptable, and willing to take risks with instruction, the content of curriculum, and classroom management.
- An investment of resources is needed to develop, support, sustain, and expand curriculum integration efforts. While financial resources are necessary to cover the costs of curriculum development, staff, training, and equipment, most of the sites visited for this study also relied heavily on in-kind contributions of materials, facilities, time, guidance from advisory groups, and political support from key stakeholder groups in the community.

In addition to documenting the circumstances and structural components that facilitate the effective integration of academic and vocational education at the secondary level, the NIWL team identified a number of lessons for both researchers and practitioners. These include observations related to: the role of the catalyst versus the role of leaders; the need for flexibility; the impacts on teachers and teaching; the importance of careful consideration to fit when selecting areas to integrate; and the structural support potentially provided by smaller learning communities.

Perhaps most important of all, the study helped to debunk some of the more pervasive myths that surround curriculum integration, and began to build an evidentiary base for expanded use of curriculum integration as a strategy for enhancing student achievement.

Recommendations for future study

Curriculum integration that represents a series of conscious and informed strategies used to connect academic and vocational content so that one becomes a platform for instruction in the other over an extended period of time can be a powerful education reform strategy. Clearly, additional research is needed to look at outcomes within the context of this new, very rigorous definition. While a focal point of future research should be measuring or determining the extent to which curriculum integration contributes to academic performance, it may be necessary to begin with an effort to determine the extent to which secondary institutions are implementing curriculum integration efforts that meet this more rigorous definition.

In the future, researchers might want to conduct large-scale surveys of schools, asking administrators to rate their school's curriculum integration efforts against each of the key elements of the definition, and then against the definition as a whole. By using the definition to determine the extent to which curriculum integration is occurring, such a survey could help to identify potential sites for further research, including projects that could feature experimental and quasi-experimental designs.

There is also a need for a concurrent technical assistance effort to promote a heightened understanding among practitioners of what curriculum integration is. In trying to identify sites for this study, the NIWL team came across many instances in which academic and vocational teachers were working together to integrate curricula through isolated short-term projects. Also plentiful were examples of vocational teachers introducing academic content into their courses without the input or collaboration of academic teachers and, to a lesser extent, examples of academic teachers attempting integration without vocational partners. While such efforts can be important stepping stones to more sophisticated curriculum integration efforts, they are not sufficient, in and of themselves, to meet the more rigorous definition of curriculum integration developed through this study.

Once practitioners understand what curriculum integration is, targeted technical assistance, informed by findings from this study, can help them move toward richer and more complex approaches to curriculum integration. Such assistance should help them think through the context in which they operate and how curriculum integration can best be implemented and sustained over longer periods of time. The revised definition can serve as both a guide and a goal.

Curriculum Integration In Context: An Exploration Of How Structures And Circumstances Affect Design And Implementation

Introduction

Does it matter who is in the driver's seat for curriculum integration efforts? Would an employer be a more effective catalyst for developing curriculum integration than a university or a team of high school faculty? Until the late 1990s, very little was known or written about the role of catalysts or drivers in the development and implementation of curriculum integration.

Formative and impact evaluations of the Lansing Area Manufacturing Partnership (LAMP) (Bell, Taylor, & MacAllum, 1998; MacAllum, Taylor, & Bell, 1999) examined an employer-driven School-to-Work initiative. These evaluation findings suggest that the catalytic role played by the United Auto Workers–General Motors Center for Human Resources (CHR) contributed significantly to the content of the initiative's integrated curriculum, the creation of critical partnerships, and both student and program outcomes. The CHR is a strongly committed catalyst that devoted considerable resources to curriculum development, a custom-built classroom in a manufacturing facility, and release time for employees who helped conceptualize, implement, and coordinate the initiative.

As an associate partner in the National Research Center Career and Technical Education,ⁱ the Academy for Educational Development National Institute for Work and Learning (NIWL) opted to build on the LAMP research base to test the hypothesis that important programmatic differences would emerge in curriculum integration efforts led by different types of stakeholders. Since LAMP data suggested that different organizational interests and perspectives affect all aspects of program design and, ultimately, the nature and impact of the reform initiative, it seemed logical to explore the extent to which a project's catalyst or driver would shape the content and delivery of curriculum integration efforts.

Looking specifically for student outcome data, project staff began to explore the theory that curriculum integration efforts led by different stakeholders might use different strategies, and yield different types of programmatic outcomes. To test this hypothesis, the team elected to conduct case studies of four curriculum integration initiatives, including: an employer-led model; one developed by university faculty; a model designed by high school teachers; and a model where the curriculum integration efforts appeared to have multiple catalysts—a "mixed" model.

While largely an outgrowth of NIWL's prior work with a specific school reform model that relied heavily on curriculum integration as an instructional delivery strategy, the research project conducted for the NRCCTE contributes to almost 100 years of scholarly attention to the concept of curriculum integration. In the early part of the 1900s, John Dewey introduced the notion of weaving together academic and vocational education to use students' existing experiences to help them acquire new knowledge. Since then, much has been written about curriculum integration, what it does, and why it is an important strategy for improving student learning. In recent years, the concept of integrating academic and vocational instruction has again become a focus of education reform efforts, appearing as a cornerstone of both the Carl D. Perkins

Vocational and Applied Technology Education Act of 1990 (Perkins II), and its successor, the Carl D. Perkins Vocational and Technical Education Act of 1998 (Perkins III), as well as the School-to-Work Opportunities Act of 1994.

Recent data reveal significant growth in the number of secondary schools and students engaged in efforts that link academic and vocational curricula. Within the local jurisdictions that completed annual school-to-work progress-measures surveys, the percentage of secondary schools offering activities integrating academic and vocational curricula climbed from 55% in 1997 to 69% in 1999. During that same period, the percentage of secondary students participating in these curriculum integration activities increased from 35% to 40% in reporting partnerships (Medrich, White, & Beltranena, 2001).

With renewed interest in curriculum integration on the part of policy makers and practitioners, researchers have spent considerable energy describing various approaches to curriculum integration (Grubb, 1995), and examining its objectives and uses (Bodilly, Ramsey, Stasz, & Eden, 1993). Studies of the effectiveness of curriculum integration efforts and best practices in the field, however, remain scarce. The bulk of research on integration-related reforms provides only descriptive data on the various forms of integration, and the challenges that education providers face in implementing such reforms.

A number of curriculum integration models and strategies have been identified in recent years, but available evidence suggests that many practitioners use them without regard to local circumstances and needs (Stasz, 1999). Relatively few studies have investigated curriculum integration at the level of instructional practice or attempted to link practices with outcomes. Little has been done to assess the quality of integration-related reforms at the classroom level, and document best practices for promoting desired student outcomes.

In the absence of meaningful assessments, efforts to integrate academic and vocational curricula encountered obstacles in some schools and communities, as increasing emphasis was placed on standards-based reforms. With higher stakes placed on attainment of academic standards, some educators perceived a need to choose between curriculum integration and coverage of required academic subject matter. Others suggested that vocational coursework could be used to augment and reinforce instruction in academic courses. Proponents contended that curriculum integration could promote more effective and efficient academic instruction, while opponents expressed fears that the infusion of vocational content would water down academic courses, leaving students ill-prepared for high-stakes tests. The current study of curriculum integration models sought to create a new evidentiary base—to replace myths and marketing assertions with factual information about the ways in which curriculum integration can be used to enhance academic performance.

Project Overview

A literature review conducted to guide site selection and protocol development found no evidence that other researchers had used the lens of program driver or catalyst to explore the nature and success of curriculum integration efforts. It also revealed that little has been written that clearly defines what curriculum integration is. The literature tends to offer descriptions of models without defining what is meant by the term. Even the various pieces of federal legislation that call for integration of academic and vocational instruction fail to offer concise and coherent language that defines the term. For example, Perkins II makes oblique references to “the incorporation of academic and vocational education” and “programs that achieve academic and vocational competencies that are measured at the completion of the program.”

In light of such ambiguity, it was necessary to craft a working definition of curriculum integration for use in the study. Team members wanted to screen out academic courses or programs that simply infused generic career exploration or career development activities (e.g., resume writing, job search skills). Recognizing that all vocational education, by necessity, incorporates some academic instruction, the team—after much deliberation—settled on a definition that seemed to require a more balanced approach to curriculum integration. For purposes of initial research, curriculum integration was defined as *a relationship between academic and occupational or career-technical subject matter that goes beyond what would normally occur in the delivery of either the academic or occupational/career-technical subject matter alone.*

A series of four intensive case studies conducted in the spring of 2001 prompted significant revisions of the research team’s hypothesis, as well as its working definition of curriculum integration. When initial findings from these case studies suggested that context is a more important factor than the catalyst in the design, implementation, and ultimate success of curriculum integration efforts, the team conducted three additional case studies in 2002 to learn more about the structural factors and components that impede or facilitate effective curriculum integration. Year 1 findings also suggested that the original working definition was overly broad, encompassing a wide range of efforts and strategies that fell short of the team’s vision of curriculum integration. Accordingly, a new definition was crafted, specifying that *curriculum integration is a series of conscious and informed strategies used to connect academic and vocational content so that one becomes a platform for instruction in the other over an extended period of time.* The revised definition was used to guide identification and selection of the three sites visited in 2002.

While this investigation of curriculum integration started with a somewhat narrow focus on the impact of the driver or catalyst on the design, implementation, and outcomes of various models, it ultimately evolved into a more comprehensive examination. As a result of initial analyses and findings, ideas and theories changed. The research team’s focus shifted from the role of key stakeholders to the identification of contextual and administrative features that support the implementation of successful and sustainable curriculum integration efforts. The remainder of this report provides more detailed information about the project methodology, the seven sites selected for case studies, and the features associated with effective curriculum integration efforts.

A concluding chapter presents ancillary findings, and suggests ways in which the findings of this study can be used as a foundation for additional research.

Methodology

In order to obtain firsthand information about different approaches and strategies for curriculum integration, case studies of curriculum integration models were conducted in seven sites across the United States. An advantage of case study methodology, characterized by intensive and focused field work, is that it provides for the collection of a rich amount of data from which to draw a comprehensive portrait of curriculum integration models and strategies. Preparation for the site visits required four major activities: site selection, staff training, protocol development, and a review of documents and materials.

Site Selection

The four models visited during Phase I of the study were selected primarily based on the identity of the catalyst or driver. Programs or initiatives also needed to be sophisticated and of high quality.

To inform site selection, the team reviewed recent literature on efforts to integrate academic and vocational curricula at the secondary level. The team also initiated discussions with other researchers and practitioners in the field. As a result of this reconnaissance, a short list of possibilities for each of the catalyst or driver categories was identified. Key people at each program were contacted to collect additional information. In making the final selections, the researchers also attempted to create a balanced mix of urban, rural, and suburban sites representing different geographic regions across the country. The sites selected included: a curriculum integration project developed by an employer–union partnership; one designed by medical school faculty; an effort initiated by high school teachers; and, finally, one with multiple drivers.

As noted, the preliminary research findings caused the NIWL team to rethink and more clearly define its notion of curriculum integration. For Phase II of the study, the team revised its site selection criteria and set out to identify curriculum integration models that met the requirements outlined in the new definition. Again, the team used a variety of methods to research possible sites, including a review of best practices and discussions with other researchers and practitioners in the field. Eighteen sites were identified. Team members followed up with key contacts at the sites to obtain additional information about curriculum integration activities. Three sites were selected: two academies and a high school district.

Sites participating in Phases I and II of the study:

- Apex High School, Academy of Information Technology, Apex, North Carolina (Phase II);
- Michael E. DeBakey High School for the Health Professions, Houston, Texas (Phase I);
- East San Gabriel Valley Regional Occupational Program Technical Center, West Covina, California (Phase I);
- Hilltop High School Travel-and-Tourism Academy, Chula Vista, California (Phase II);
- Johnson County High School, Agriculture Program, Mountain City, Tennessee Phase I;
- Lansing Area Manufacturing Partnership, Lansing, Michigan (Phase I); and
- Phoenix Union High School District, Phoenix, Arizona (Phase II).

Staff Training

NIWL staff participating in the case studies attended a one-day training to become better oriented in case study methodology. Topics covered included: a comparison of quantitative and qualitative research; the nature and purpose of case study research; the process of doing a case study, including issues related to the pre-visit, visit, and post-visit; benefits and limitations of the case study approach; issues related to information collection, including triangulation, ethical considerations, ecological reduction, and interview skills; strategies and methods such as observation, document review, and focus groups; and report preparation.

Protocol Development

To ensure consistency in the kinds of information collected across the sites, semi-structured, open-ended interview protocols were developed to guide interviews and focus groups. For Phase I of the study, protocols were created for the initial catalysts or drivers, school administrators, school staff, students, and other partners—a category that included employers, postsecondary institutions, and community-based organizations contributing to curriculum integration efforts, but not as the catalyst or driver. Questions were organized under the following major topic areas: Curriculum Integration Goals; Context/History; Project Design; Outcomes; and Lessons Learned (see Appendix). For the second phase of the study, the team revised the protocols slightly to reflect Phase I findings and the new definition. A few of the questions relating specifically to the role of the driver or catalyst were eliminated, and questions that would help the team explore contextual features were added.

Document Review

The team conducted an extensive review of existing documents in order to understand the nature and history of the initiative. Prior to the site visits, the team looked at local evaluation and communications materials, mission statements, organizational charts, and community demographic information for each site. After the site visits, the team reviewed additional documents collected on-site, including meeting minutes, program reports, curriculum samples, and, where possible, data describing or assessing the impacts of curriculum integration on students.

Site Visits

Between April and June 2001, the research team visited each of the four sites selected for participation in Phase I of the study to learn more about the development and implementation of the different models. Phase II site visits were made during April and May 2002. For both sets of site visits, teams of two researchers spent 3–4 days in each community, observing activities and conducting individual and group interviews and focus groups with school administrators, teachers, guidance counselors, employers, parents, students, and representatives from participating postsecondary institutions. The NIWL research team conducted over 80 interviews across the seven sites.

Data Analysis

Each site-visit team analyzed fieldwork notes, using the principle of data triangulation to ensure that findings were affirmed by at least three sources of information. For each site, profiles were created to describe key elements of the curriculum integration activities (see next section of this report).

The entire research team then convened to discuss crosscutting elements, relating and synthesizing findings, and trends. The team considered the elements identified as critical at each site, and explored similarities and variations across sites. Key findings from the cross comparison can be found in later sections of this report.

Site Profiles

This section of the report contains detailed descriptions of each of the seven sites. In addition to a general overview, each description provides insight into the goals and history of curriculum integration efforts, and the design, context and outcomes of curriculum integration.

Apex High School Academy of Information Technology

Apex High School is located in a suburb of Raleigh, North Carolina, in close proximity to Research Triangle Park. Until the recent economic downturn, the local economy was booming, supported largely by high tech-industry. Despite the current recession and lay-offs by many high-tech businesses, Apex is still a relatively affluent suburb, with only about five% of students receiving free or reduced-price lunch. The majority of the students are White (about 80%). Approximately 13% of the student population is African-American, and the remaining students are either Hispanic or Asian.

Apex High School has achieved *exemplary status* for the past 3 years on the state's academic accountability plan. Community demographics are such that most parents expect their children to pursue postsecondary education at a college or university after graduating from high school. Approximately 85% of students take the SAT, with an average score of 1082.

Apex High School's Academy of Information Technology (AOIT) was launched at the beginning of the 2001–2002 school year, with 68 grade students. The demographics of participants mirrored those of the school as a whole. The first class included approximately equal numbers of males and females. Many of the AOITs students enrolled because they had an interest in computers and technology. Others indicated that they believed it would help them in preparing for their educational goals, regardless of their intended field of study. Most indicated that they believed the academy credential would be helpful in college admissions.

Goals of curriculum integration

In creating the AOIT, program designers wanted to integrate curricula across a career area. Because high-tech industry plays such a major role in the local economy, an Information Technology (IT) academy seemed like a natural fit. Academy staff would have access to employers in the industry, who could review the curriculum, provide resources, and possibly host student interns. The academy was designed to prepare students to meet entrance requirements for both state universities and 2-year postsecondary institutions. Technology skills are necessary for almost any job in the modern workplace, so even if AOIT students chose not to pursue postsecondary education or training that would lead to careers in IT, they would still be better prepared for the world of work than most of their non-AOIT peers.

History

The AOIT was conceived in 1999, when a team from Apex High School attended a Wake County Public School System school-to-career institute that focused on the alignment of career development and school improvement plans. Apex High School's curriculum integration

coordinator, who also serves as the department chair for career and technical education, was a member of the Apex team. As the person responsible for facilitating the integration of career and technical education and academic classes, she became enthused about the academy concept, and saw how it could provide a framework for curriculum integration.

After attending a National Academy Foundation (NAF) conference, she decided to pursue the possibility of creating an IT academy at Apex High School, and proposed the idea to the school's principal, and then the school's business alliance (which included representatives from a number of IT companies). The principal agreed to support the development of the AOIT, as long as the school did not have to provide all of the resources. Business alliance leadership also agreed to support the effort. The curriculum integration coordinator presented the model to the school improvement team as well. Their buy-in was essential to building school-wide support, since the smaller academy classes would most likely result in larger classes for other teachers in the school.

Planning for the Apex AOIT officially began in 2000–2001. The curriculum integration coordinator, with assistance from one of the school's vice principals and the district's school-to-career coordinator, submitted a proposal to NAF, with the school district agreeing to pay the \$5,000 NAF fee. Because district policy expressly forbids schools in the Wake County Public School System from soliciting money from business alliance members, a separate advisory board was created to support the AOIT.

Recruitment for the first academy class began in the spring of 2001, with the curriculum integration coordinator, who had also taken on the role of AOIT coordinator, distributing materials and one-page applications to grade students and their parents at school information nights. The model was designed for a cohort of 90 students. Because the academy had fewer than 90 applicants, a selection process was not necessary.

The AOIT coordinator and school administrators also began the process of recruiting teachers for the academy's classes. The coordinator targeted veteran teachers with an interest in technology, thinking they would be comfortable and confident enough in their subject areas to adapt content and delivery strategies, and would support integration. The coordinator hoped that using more experienced teachers would generate political support for the academy effort. One teacher for each area—math, English, science, and IT were selected. Team members had worked together previously as part of an off-site teaching corps, and were familiar with the team concept.

During the summer of 2001, the Wake County Public School System sent the academy teachers to the annual NAF conference, in preparation for the pilot year. The academy teachers and coordinator met again later that summer to revise curricula and create integrated projects to supplement required course material. The first cohort of students entered in the fall of 2001.

Design

The course framework for Apex High School's AOIT is structured to accommodate the state's courses of study. In North Carolina, high school students must complete a course of study in one

of four state-defined pathways. Students in the AOIT are either in the state's college/university prep or college tech prep course of study. Students in the college/university prep course of study are required to take 4 math credits and 2 years of foreign language. Many also take a number of honors courses. Beginning in the fall of 2002, students in the college tech prep course of study will also be required to take 4 years of math. In addition, they must complete four CTE courses, including one upper-level course. There is no foreign language requirement.

The Apex AOIT is being built over a 4-year period, with a new cohort of students added each year. During the initial year of implementation, efforts were focused on developing integrated materials and hands-on activities for students in the ninth grade. Curriculum for 10th graders in the AOIT will be added next year, with activities for students in grades 11 and 12 added the following years.

The Apex AOIT functions as a small learning community. Curriculum integration efforts allow students to explore and apply the uses of information technology through their academic studies. Skills acquired through computer applications and/or programming courses are used to support projects in English, math, and biology.

At the grade level, most AOIT students spend the first four periods of the day exclusively with other AOIT students. During these four periods, ninth graders take English, math, biology, and computer applications, although some students opt to take programming instead of computer applications. AOIT students can be enrolled in one of three math courses—algebra I, part I; algebra I; or honors geometry—depending on their skill levels. All AOIT students, regardless of knowledge and comprehension levels, are mixed together in biology class. AOIT classes are located in close proximity to one another, which facilitates communication among AOIT teachers and students. Students take two additional classes each day that are not part of the academy.

During the grade year, all 4-academy teachers participated in interdisciplinary projects that use quarterly off-site field trips as a focal point for curriculum integration. Students' work in teams using English, math, biology, and IT skills to complete group assignments related to the field trips. For example, students went on a field trip to the ballet *Romeo and Juliet*. The play is required reading for grade English. After the field trip, each student team created a different marketing program (e.g., a corporate sales incentive package, an elementary school matinee, a sweetheart package) for the ballet. They used technology to prepare the promotional materials, math to set pricing, and biology to explore the physiological aspects of dance. They later used the ballet as the discussion topic for an introductory lesson on video conferencing. Such team experiences were cited as valuable by students, parents, teachers, and the advisory group.

The AOIT benefits from extensive technical resources, including a fully-equipped computer lab. Teachers have video presenters for their classrooms, and digital and video cameras are available for teacher and student use. The biology teacher's use of digital cameras, 3-D presenters, and graphic software to enhance the students' rat-dissection lab exercise provides an example of how teachers incorporate technology into academic instruction. The teacher photographed the rats using video display; the photos were converted to diskettes; and each student team worked on a computer with labeling software to identify key body parts on the pictures. The teacher reported

that students seem to grasp key concepts and information more quickly through the use of technology.

Each of the four academy teachers has three AOIT classes and one other class every morning. Academic teachers report that the IT content influences all their instruction. For instance, the biology teacher is using more graphics and visual presentations in his non-AOIT biology class as a result of his experiences in the AOIT. Sixth period is set aside to provide AOIT teachers with common planning time. The district's school-to-career coordinator, the AOIT coordinator, and AOIT teachers emphasized the importance of the common planning period, indicating that it is essential to supporting high-quality integration efforts.

During their sophomore year, AOIT students will be expected to take Padeia (integrated English and world civilization), computer applications II or programming, and earth science or environmental science. Due to resource constraints (both human and financial creating separate classes consisting of only AOIT students will not be possible, as was done in the ninth grade, and AOIT 10th graders will be in classes with 10th-grade students not in the academy. However, AOIT 10th graders will be hand-scheduled into core courses taught by a team of teachers who have committed to academy principles and the extensive use of curriculum integration. These teachers will design several integrated projects, and the program will involve a job-shadowing component.

Other required CTE courses in the AOIT will include more advanced classes in computer applications, programming, system support, databases, and digital networks and systems. Plans include a summer internship component for students between their junior and senior years.

The AOIT's academic teachers are required to cover the same curricula as their colleagues throughout the state, and students are assessed using the same statewide End of Course (EOC) tests. In addition, students take tests at the end of each career and technical education class to determine mastery of IT-related skills and knowledge. Students build electronic portfolios and are also graded on their work on individual and team projects. The teachers often grade students' work as a team.

The AOIT has a parent support group, which works with AOIT teachers and students on fundraising activities. During the past school year, the group hosted a raffle and ran a concession stand at a local concert venue to raise funds for academy activities. Representatives from the parent support group also accompany students on field trips. The group's president estimated that approximately 25 % of the parents of AOIT students are active members.

As previously mentioned, the AOIT has an advisory board composed of local business leaders and parents, with some cross-pollination with the parent support group and the school's business alliance. The advisory board meets regularly to review project budgets, critique integrated projects, discuss future plans, and assist with fundraising. It serves as a sounding board for the AOIT coordinator and provides a real world perspective for the program. For instance, members of the advisory board sponsor site visits and participate in in-school programs. Many have signed up to work with students as e-mail buddies (mentors). As the AOIT coordinator and team develop the summer internship component of the program, the advisory board will play an

important role in identifying businesses to host student interns—a task that all recognize will be a challenge.

The AOIT coordinator and the advisory board would like to strengthen connections with North Carolina State University (NCSU) in order to build a bridge for students between the AOIT and NCSU's computer science baccalaureate programs. Ideally, AOIT students applying to the university's computer science program would be given special consideration during the admissions process.

Context

The prevalence of IT companies in the region influenced the decision to develop an IT academy, as opposed to one with a finance, or travel-and-tourism, focus. The community context dictated that the academy could not be limited to traditional CTE students, since parents in the community expect that their children will attend a baccalaureate institution after high school graduation. In developing the academy, the project coordinator and high school administrators were cognizant of the need to build options for honors classes into the academy framework.

At the same time, the project coordinator and school administration didn't want to exclude students interested in pursuing associate and technical degrees. As a result, the AOIT course sequence is structured to allow students to meet requirements of either the college/university prep or college tech prep courses of study. However, this leaves AOIT participants with little room in their schedules for other electives a problem that will be remedied when the school moves into block scheduling in the 2003–2004 school year.

When the idea for the AOIT was first explored, the local economy was booming. The economic downturn has meant fewer resources are available to support programs such as the AOIT. With limited corporate contributions and the district facing budget constraints, the Apex AOIT has operated with considerably less funding than originally anticipated. Still, in-kind and political support for the program remains strong.

Although school administrators are working to help other teachers understand that the AOIT is a school-wide priority, they acknowledge that scheduling can be problematic. In some cases, a non-academy teacher may have a larger class, even though a simultaneous academy class is not full. As additional classes are added to the academy, scheduling will become even more of an issue. There is also some concern that the AOIT coordinator may be stretched thin, given other responsibilities as the CTE Department Chair and curriculum integration coordinator.

The AOIT coordinator observed that it is hard at first for some teachers to understand that integrated curriculum strengthens their ability to prepare students for the state's EOC tests. Many see it initially as a trade-off, meaning, if they try to incorporate integrated curriculum into their classroom lesson plans, it will be at the expense of material they need to cover for the state's tests. Over time, teachers have learned that, in many instances, they can actually cover more content through curriculum integration.

Outcomes

Currently, the AOIT at Apex High School has no formal evaluation component. The academy is still too new. The principal at Apex would like to work through a full 4-year cycle of the pilot before trying to make comparisons and draw conclusions. However, the AOIT teachers, coordinator, and parent support group, Apex High School administrators, and the district's leadership will all be looking at AOIT students' performance on the most recent EOC tests as of future outcomes. AOIT teachers believe that their students' EOC scores will provide early evidence of the academy's success.

In the absence of evaluation data, teachers, parents, and the project coordinator all reported noticeable changes in participating students. The coordinator observed that students seem to have more self-confidence. One teacher noted that the quality of students' written and oral presentations has improved. Another suggested that AOIT students seem to be more motivated than other ninth graders—students will take the initiative to go beyond what is required to complete an assignment. For instance, the biology teacher provided examples of students' lab reports for which the only explicit requirement was that the reports be typed. Several students took extra efforts to incorporate charts and digital photos into their work products as well. Teachers reported that their AOIT students achieve at higher levels than students in their non-AOIT classes.

Overall, feedback has been positive. The district's school-to-career coordinator reported that the IT academy at Apex High School is one of only a few academies in the district that are truly integrating the curriculum for academic and career and technical education subject areas. AOIT teachers have bonded together and take considerable pride in the accomplishments of their students. Business partners and parents continue to enthusiastically support the effort.

Michael E. DeBakey High School for the Health Professions

The Michael E. DeBakey High School for the Health Professions (DeBakey), a magnet high school with a focus on health care, is located at the Texas Medical Center—a huge facility comprising 42 institutions. Despite being a vocational school, DeBakey is known for its selectivity and rigorous academic program. Students must apply and be accepted to attend DeBakey. Selection criteria include the student's scores on standardized tests; grades; conduct; the student's past achievement in the core-course areas of math, science, and history; and writing skills, as demonstrated in an essay. The school generally receives about 1,200 applications each year. It accepts only one quarter of the applicants.

In the 2000–2001 school year, approximately 655 students attended the school. Students were predominantly female (70%). The majority of students came from working or middle-class families. Approximately 25 % were eligible for free or reduced-price lunch. Slightly more than one third were African-American, nearly one quarter Asian, another quarter Hispanic, and about 10% were White.

Goals of curriculum integration

Postsecondary educators from the Baylor College of Medicine (BCM) served as the initial catalyst for the curriculum integration efforts at DeBakey High School. In the early 1970s, Michael E. DeBakey, then president of BCM, became concerned about the shortage of licensed practical nurses (LPNs) and medical technicians, noting in particular the lack of minorities in the health professions. He approached his colleagues at Baylor and challenged them to find a way to encourage students, especially minority students, to explore careers in health-care-related occupations. In response, BCM formed a partnership with the Houston Intermediate School District (HISD) and established a vocational school with a focus on providing young people interested in health care and health sciences with exposure to and preparation for work in the allied health professions.

Several years later, BCM's leadership decided to redefine its goals with respect to DeBakey High School. The new emphasis would be on preparing young people for more advanced careers in the medical profession, as opposed to preparing them for careers in the allied health field. While health care continues to serve as the context for learning at DeBakey, the content is now less vocational, and instruction is geared more toward preparing young people for college and, if the student so desires, medical school or advanced study in the health sciences.

History

DeBakey High School was founded as a vocational high school with a health occupations focus under the aegis of BCM in the early 1970s. The president of BCM and his colleagues formed a committee and approached HISD with a proposal to start a school that would prepare young people to work in the allied health professions. HISD accepted their proposal, and a partnership was formed. For the first several years, the school was actually located on the BCM campus.

In the early 1980s, school administrators realized that some of the students attending DeBakey were both interested in and capable of pursuing health care careers that would require more than vocational training. In response, a parallel college-preparatory-track program was created. Students interested in preparing for careers in the allied health professions could enroll in a series of vocational courses focused on health care, and participate in work-study. Students interested in pursuing careers that require postsecondary education would enroll primarily in college prep courses, but would also be required to take one health-care-occupation or health science class. Students in the college prep track would not be required to take any vocational classes, and would not need to participate in work study.

In the late 1980s, concerned by reports that student test scores were going down and the school's graduates were not doing well in college, both the HISD and BCM leaderships realized that the instructional practices and overall content at DeBakey needed to be reviewed and revised. Leaders at BCM actually threatened to break off their affiliation and support if substantial changes were not made immediately. Soon after, there was a marked shift in instructional emphasis, and the traditional vocational track at the school was dropped entirely. From that point on, college preparation became the priority, even though the school and all its students are categorized as vocational by the district.

As part of the transition, a dean of instruction for DeBakey was hired. The Dean was a member of the BCM faculty, but the salary was paid by HISD. The dean's office was on the DeBakey Campus, but the dean participated as a faculty member of both BCM and DeBakey. The position's primary responsibility was to raise the academic level of the program of instruction at DeBakey, focusing on the health sciences curriculum working with the dean; BCM staff also had a large role in revising the curriculum.

HISD brought in a new principal to troubleshoot during this period. Over time, that role evolved, and the principal became a key change agent, pushing for new programs and challenging the faculty to stretch beyond their academic subject areas.

While still focusing on health care, but under new leadership and with new curriculum, content, and instruction, the program became less vocational and more academic. Traditional vocational programs were phased out over a 4-year period, with the last vocational students graduating in 1993. Paid co-op placements became unpaid internships known as preceptorships, designed to provide DeBakey students with more in-depth opportunities for career exploration. Advanced-placement calculus and at least one advanced-placement science class became course requirements for all students. In addition, all students were strongly encouraged to take advanced placement economics, history, Spanish, and English. In the end, the size of the vocational staff was reduced by half, and DeBakey became a highly selective magnet school.

Initially, these changes were met with resistance especially on the part of vocational teachers, vocational students, and their parents. To counteract this resistance, the new principal established a community advisory committee, made up of parents and business people in the community, and chaired by a physician from the Texas Medical Center. This group worked to generate support for the changes at DeBakey by sharing information and conducting outreach to parents and the community.

Ultimately, DeBakey again became a school of choice. At present, many students apply to DeBakey not because of its health care orientation, but because it has a reputation for being academically challenging, and is viewed as a means for strengthening college and scholarship applications.

Design

Curriculum integration at DeBakey is theme-based. All teachers use health care as the context for instruction. DeBakey uses a block schedule to accommodate project-based learning and labs and to allow for in-depth discussions around health-related issues.

The degree of curriculum integration varies, depending on the instructor. For instance, students must learn how to use the medical library to prepare research papers for English and social studies classes. Academic teachers at DeBakey quickly come to realize that by integrating health-care-related topics into their lesson plans; they more easily engage their students, since this is where the students' interests lie. One French teacher has students read and discuss *The Plague* by Albert Camus, providing a health-related segment for his foreign-language instruction. One of the physics teachers helps students understand the complex properties of light and sound using eye and ear mechanics. Every new teacher is assigned a mentor who provides one-on-one guidance in classroom management and planning, and helps identify strategies for incorporating health care themes into lesson plans and classroom activities.

Just as the academic classes at DeBakey integrate elements of health science and health occupations, the curriculum used in the health occupations classes emphasizes academic theories and concepts. For example, in health sciences classes (e.g., medical terminology, anatomy, physiology, med lab, dental assisting, patient care science), students must draw from lessons in math and English to work scientific formulas and prepare reports. In fact, the curricula for all classes at DeBakey, including physical education, contain substantial writing components. All tests contain at least one essay question. Initially, the school brought in outside consultants to work with teachers on infusing writing into their courses. In-house writing instructors continue to provide teachers with support on an as-needed basis.

Seniors participate in preceptorships at the Texas Medical Center to explore health-related careers in greater depth, and to apply theories and concepts learned in both their academic and health-related classes. Through the preceptorships, students spend two 3-hour class periods each week shadowing medical professionals in the workplace. On Fridays, students attend a preceptorship class where they discuss some of their experiences and further examine the connections between their academic coursework and their workplace experiences. For example, one student noted and shared with her class how the surgeons she was observing used geometry to assess a broken bone. At other times, the preceptorship class discussed legal and ethical issues in the health sciences, and reviewed British literature in order to identify the different illnesses that plagued England during different time periods.

Each week, the students participating in preceptorships, with guidance from teachers and workplace mentors, set learning objectives for themselves. At the end of each week, they complete a journal-writing exercise on what they learned and how it relates to these objectives. Students also use their journals to identify new vocabulary words learned while on the preceptorships.

In yet another effort to reinforce the interrelationships between academic and health-related subject matter, each year students complete projects that cut across all disciplines. Last year,

student teams were assigned a millennium project that is they explored a century. They had to research the geography, health issues, and other key events of their chosen century. Another year, the students were asked to examine the health, social, and economic impacts of the Ebola virus. The Ebola virus and the cultures of Africa became themes for most of the courses. For example, in economics classes, students studied the impact of the virus and other health issues on the economy, from an historical perspective.

In support of curriculum integration efforts, teachers meet several times a year to coordinate projects and discuss lesson plans. Time is set-aside during professional development days for teachers from different grades in the same subject area to meet as vertical teams (e.g., English teachers, grades 9–12), and they align the coursework for their subject. Time is also set aside so that teachers from different subject areas across each grade can meet and plan. Every summer, teachers participate in a week-long professional development activity that helps them identify the integration themes (e.g., the millennium project, diseases in Africa) that they will incorporate into their plans for the coming year. Throughout the year, teachers also share information, formally and informally, in an effort to identify when their classroom activities complement and reinforce lessons that their colleagues are teaching.

Context

At DeBakey, the focus is primarily on academics, but mastery of academic content is viewed as a means for achieving career goals in high-level health-related professions. At the same time, staff at DeBakey use students' interest in the health professions to challenge them to excel in their academic classes.

DeBakey benefits greatly from its ongoing relationship with BCM. When the content and instruction at DeBakey were revised in the late-1980s, BCM's support and backing were critical in convincing the community that change was necessary. In addition to providing a dean of instruction and spearheading various curriculum development efforts, BCM also supplies a steady stream of speakers, tours, and mentors for both students and teachers. Department directors at Texas Medical Center strongly encourage their staff to host students in preceptorships. This is a considerable commitment on the part of Baylor and the Medical Center's staff, as these employees must spend 6 hours a week guiding the students through the realities of life and death in a high-stress environment. Finally, the president of the Texas Medical Center, because of his connections to Baylor, has offered to provide the HISD with land for a new building, and is working with district and school administrators to identify funding sources to help purchase the new building and equipment.

Outcomes

Almost all (99 percent) DeBakey graduates go on to college. Last year, DeBakey students won \$12 million in scholarships from a variety of postsecondary institutions, including Harvard. According to data collected through a longitudinal study funded by Baylor, 57–60% of DeBakey graduates pursue postsecondary education or training that will lead to advanced careers in the health fields.

The leadership at BCM, in an effort to ensure that DeBakey students have the opportunity to become doctors, has entered into a partnership with the University of Houston. Ten students each year are offered full scholarships to the University. Throughout their studies, this group of students is treated as a cohort, with special support from BCM. To stay in the program, students must maintain a 3.0 grade point average. Upon successful completion of the program and graduation from the University of Houston, this cohort is also given admission and full scholarships to BCM. In an ironic twist, BCM is actually having a hard time getting students to apply for these scholarships because so many of them are already being offered full rides from bigger name schools outside the Houston area.

According to information collected through graduate exit surveys, most DeBakey students believe they are better prepared for postsecondary education and work than their friends who attended other high schools. Students report believing they leave with an in-depth understanding of the complexities of a variety of careers in the health care field, the nature of relationships among the different health-care-related professions, and the relationships between what they have learned in their academic classes and health care occupations.

East San Gabriel Valley Regional Occupational Program Technical Center

For almost 3 decades, the East San Gabriel Valley Regional Occupational Program Technical Center (ESGVROP/TC) has been serving young people in the eastern part of Los Angeles County. The ESGVROP/TC is a partnership composed of seven school districts, four community colleges, and three state universities. The superintendent of the ROP has peer-status with leaders of the participating school districts.

The ESGVROP/TC has two main campuses—Del Norte and Sunflower. The typical student spends half the school day at a home high school in academic classes, and 2–4 hours in classes and related activities (e.g., work placements) offered by the ESGVROP/TC. Most ROP’s classes are held at the Del Norte and Sunflower campuses, with the remainder offered at partner schools.ⁱⁱ

During the 2000–2001 school year, 7,000–8,000 students were enrolled in classes offered by the ESGVROP/TC. While programs are designed primarily for students in grades 11 and 12, students in grades 9 and 10 can attend classes on a space-available basis with approval from both their guidance counselor and principal. This past year, slightly more than half of the students attending classes at the ESGVROP/TC were Hispanic. Almost one quarter were White, 20% Asian-Pacific, and 4% African-American. Almost one third of the students came from families with incomes below the poverty level.

Goals of curriculum integration

Since their creation in 1967, Regional Occupational Programs (ROPs) have been California’s vehicle for consolidating federal and state funds to provide regional employment training and workforce preparation programs to both high school students and adult learners. Currently, 74 ROPs are scattered throughout the state.

Course offerings at the ESGVROP/TC cover the spectrum of vocational education, and include everything from cosmetology and word processing to GIS satellite imaging systems and multi-media. Courses are organized under six general pathway areas: Trade/Industry; Business; Marketing; Arts and Communication; Health; and Public Service. In California, ROP classes are considered capstone courses for career pathways. Students who attend ESGVROP/TC can earn high school credits, certificates, articulated credits that count toward degrees at partner postsecondary institutions, and, on a limited basis, postsecondary degrees. (The U.S. Department of Education has approved the ESGVROP/TC as a postsecondary institution.)

The ESGVROP/TC emphasizes content over sequence. While many high schools have established algebra I as a prerequisite for geometry, the ESGVROP/TC faculty and administrators recognize that geometry can help some students learn basic algebra concepts. Thus, ESGVROP/TC students who have never taken algebra I may be enrolled in vocational courses that require regular use of geometry. In some instances, the opportunity to use geometric concepts in applied settings has prompted students to move into higher-level math classes at their home high schools.

Through curriculum integration, administrators and participating faculty hope to empower students to take ownership of learning and prepare them to apply knowledge successfully in the workplace. They also hope to support academic teachers at the students' home schools by providing a complementary set of learning experiences that will strengthen students' understanding of academic theories and principles.

History

According to its superintendent, the ESGVROP/TC has been attempting curriculum integration since the 1980s. Preliminary efforts involved incorporating academic lessons into vocational classroom activities as needed. The ESGVROP/TC has secured a series of competitive federal and state grants to support implementation and continuation of curriculum development activities.

In the early 1990s, the ESGVROP/TC staff began to identify outcomes that required students to use both career and academic knowledge. In 1994, in an effort to help teachers become more familiar with how to develop and use integrated curriculum, the ESGVROP/TC sponsored its first Summer Institute for Integration of Academic and Vocational Learning. Academic teachers were paired with technical/vocational teachers and asked to develop lesson plans that both could use in their classes. For each lesson, teachers were to identify the academic and vocational/technical objectives for the lesson, and the competencies and content standards addressed. During the six-week workshop, additional support was provided by business people from the community and a technical writer from the community college.

The result was a collection of 41 lesson plans for curriculum integration. A second institute was held during the summer of 1995, and 30 more lesson plans were created. These lessons were bound into a three-volume set, *Integration of Academic and Career Learning: Integrated Activities*, that has been shared with educators across the United States. As an outgrowth of this activity, the ESGVROP/TC is working with the Horizons School-to-Career Partnership in San

Bernadino County to create a virtual library that will contain and expand on many of these lesson plans, as well as other models of contextual teaching and learning.

Most recently, the superintendent and many of the teachers at the ESGVROP/TC have embraced Design-Based Learning (DBL) as a means to engage young people in their coursework. With roots tracing back to Dewey's notion of learning by doing, and later efforts to apply the tools and techniques of the product design profession to project-based learning, DBL is now offered as an innovative master's degree program at California State Polytechnic University at Pomona, one of the ESGVROP/TC postsecondary partners. The superintendent and other administrators also characterize DBL as a primary focus of the ESGVROP/TC's current curriculum integration efforts.

Design

DBL combines interdisciplinary lessons, project-based learning, teamwork, and problem solving in order to encourage students to explore subjects through a method of backwards thinking. For each DBL project, students and teachers work together to identify a challenge. For example, students are often asked to work together in small groups to build models of *never before seen* workplaces. Together, the teacher and students set criteria against which performance will be evaluated, using a set of teacher-designated *needs* and student-designated *don't wants*. (For instance, the teacher tells the students that they need to review and cite three sources in the process of doing research for the project. The students don't want to write a report on their findings, but would rather report back to the class orally.) Next, teams of students test out their ideas or solutions by building models. The teacher breaks down the activities from the project, and shows students how they are actually using academic knowledge and vocational skills to solve problems that arise while building their models. The students and teachers review the projects and the process used in completing them against the criteria, and identify recommendations for improvement.

Students in the cosmetology class built a model of the *never before seen spa of the year 2030*. Students in a health occupations class proudly displayed their *never before seen wellness center*. In designing these models and building them to scale, students have an opportunity to apply academic knowledge (e.g., math skills), but also have a chance to develop SCANSⁱⁱⁱ skills such as teamwork, critical thinking, problem solving, and communication. In some classes, students are also participating in simulations, such as running a hypothetical city or restaurant, as part of the DBL activities.

While DBL proponents report that this pedagogy gives students opportunities to think, solve problems, make mistakes, and learn as a community through a design project, they acknowledge that DBL cannot be used effectively in all instructional settings. For example, a teacher who includes grammar, spelling, and punctuation as needs in the project-performance criteria may have to use drill-and-practice and other pedagogical strategies to help students acquire these basic skills. One teacher indicated that she referred to basic skills as conventions that are generally included in project performance criteria. If projects fall short on conventions, she uses this as a springboard for a mini-lesson on grammar. She believes that tying workplace

expectations such as proper grammar to the creation process gives students a reason to care about using language correctly.

Teachers can receive training in DBL through a graduate course at California State Polytechnic University, or courses offered on site at the ESGVROP/TC Del Norte campus. Some of the ROP teachers who have been trained in DBL are now teaching DBL classes. Administrators at ESGVROP/TC are also working with the California School Leadership Academy^{iv} to design a professional development activity that models backwards thinking for ROP teachers. More than one third of the teachers at ESGVROP/TC have been trained in DBL, and approximately two thirds of those trained are using DBL strategies on a regular basis. Another 25% report that they are in the process of adapting the curriculum to include elements of DBL. While the DBL course was also offered to academic teachers from the students' sending-schools last summer, the NIWL research team was told that many of the academic teachers who took the course are not using DBL because they are not comfortable stepping out of sequence, given the pressures of preparing their students for state testing.

While DBL is at the crux of curriculum integration at the ESGVROP/TC, it is only one of several different instructional strategies that teachers are using. For example, students are also exposed to academic content through everyday classroom activities at the ROP; clinical or lab situations and simulated exercises; team projects; work-based internships; and participation in student organizations such as DECA,^v FBLA^{vi}, and Exploring per BSA.^{vii} In particular, teachers are using project-based learning to help students understand how academic theories and knowledge can be applied in different vocational environments.

Context

Site visits to ESGVROP/TC, observance of classes, and key-stakeholders interviews, made it apparent that curriculum integration efforts are orchestrated largely by the superintendent, not by a consortium of stakeholders, as originally thought. Employers and college/university faculty are heavily engaged in some of the curriculum integration activities, but the scope, direction, and tone of these activities are generally established by the superintendent.

California recently adopted a new set of K–12 content standards for English/language arts, math, history/social science, and science. Beginning with the graduating class of 2004, all California students will have to demonstrate mastery of these standards by passing a state-mandated exit exam in order to receive a high school diploma. Even though the onus for preparing students to pass the exit exam is on academic teachers at the 19 sending schools, teachers and administrators at the ESGVROP/TC are working to identify areas of overlap between the curricula used in their vocational classes and these standards. Their goal is to make the sending schools cognizant of where and how state standards are covered in the ROP curricula. They hope academic teachers and guidance counselors will view vocational courses not as time spent away from academic studies, but as a means for providing additional support to students in the academic areas where they are weakest.

Under the lead of the superintendent, teachers and administrators at the ESGVROP/TC are supporting curriculum integration to the extent that they can, given that the ROP functions as a

regional service provider. Because the ESGVROP/TC works with multiple school partners, and is required to provide vocational instruction in a number of occupational areas, teachers at the ESGVROP/TC have only a limited number of opportunities, if any, to coordinate around content and instruction with students' academic teachers at the sending schools. As a result, curriculum integration efforts undertaken by the ESGVROP/TC happen largely in isolation from instruction and classroom activities at students' home schools. Unfortunately, this trend is likely to continue, as academic teachers struggle to prepare students to pass the new high school exit exam.

Outcomes

The University of California Riverside has been working with the ESGVROP/TC for the past several years as part of a state-funded study of ROPs. Researchers have collected information on students' attitudes, school, impacts academic performance, and postsecondary outcomes. Thus far, data indicate a significant decrease in the high school dropout rate for young people participating in programs at the ESGVROP/TC. Preliminary data also show that while DBL strategies have only a modest impact on above-average performers (students whose baseline GPAs are *A* and *B*), they have a significant impact on low performers. As evidence of success, staff reports that low performers are realizing considerable gains in achievement of state standards, as well as improved GPAs. Furthermore, most teachers who have adopted DBL strategies into regular use in their classrooms are very enthusiastic about the practice, and report that their students seem more engaged in classroom activities.

Hilltop High School Travel-and-tourism Academy

Hilltop High School is located in Chula Vista, California, between the city of San Diego and the Mexican border. The four-year comprehensive high school is one of 11, soon to be 12, high schools in the Sweetwater Union High School District. The district also has nine middle and junior high schools, five adult schools, eight learning centers for dropout recovery and prevention, and a Regional Occupation Program (ROP) that supports regional training and workforce preparation.

Due to rapid growth in the area, local schools are stretched to capacity. Hilltop High School was built to serve 1,500 students, but currently serves approximately 2,200. Approximately 60% of the students are Hispanic. Most come from low- or middle-income households.

A total of 120 students were enrolled in Hilltop High School's travel-and-tourism academy during the 2001–2002 school year. The ethnic breakdown was similar to that of the high school, with 60% of the academy's students being Hispanic, 35% White, and the remaining students Asian or African-American. Generally, an equal number of males and females constitute the academy's student body.

Many academy students decide to enroll because they like the idea of being part of a smaller learning community. Academy classes are limited in size, students spend most of the school day together, and classroom activities involve a substantial amount of teamwork—so students get to know each other and their teachers very well. While students will ideally begin in the 9th-grade

pre-academy, they can join during their sophomore and junior years on a space-available basis. High school and academy administrators try to keep class size to 30–35 students.

Goals of curriculum integration

For over a decade, Hilltop High School has provided interdisciplinary instruction in English and the social sciences, with an emphasis on foreign language study through a Foreign Language and Global Studies (FLAGS) magnet program for academically talented students. Administrators wanted to create smaller learning communities for students in the middle third of their class in terms of academic achievement, as well. In place of emphasis on foreign language studies, administrators believed the new effort should provide young people with opportunities for career exploration. Through smaller learning communities with industry themes, administrators hoped to help students attain higher levels of academic achievement, develop career awareness, and acquire key employability skills. While administrators were interested in replicating the strategies for creating links between students' studies in English and social sciences classes developed in the FLAGS program, the integration of career and academic information was not a primary goal.

History

Efforts to create a travel-and-tourism academy at Hilltop High School began in 1995. As previously mentioned, administrators were grappling with how to best meet the needs of students in the middle tier. One of the school's assistant principals and a small team of teachers traveled to San Jose, California, to visit a National Academy Foundation (NAF) travel-and-tourism academy. Based on observations and conversations with teachers and administrators in San Jose, they became convinced that the academy model would provide them with a way to support academic achievement and workplace readiness goals of smaller groups of students within the larger comprehensive high school. Because the travel-and-tourism industry plays such a predominant role in the San Diego local economy, an academy with a travel-and-tourism theme seemed like a natural place to start.

Hilltop High School sent a proposal for a travel-and-tourism academy to NAF in 1995, and was granted NAF approval in the spring of 1996. The following fall, the school also applied for and received a California Partnership Academy grant to help support further implementation.

During the initial planning phase, the academy team identified two directors—one to support curriculum development, and the other to support business and community outreach activities. These individuals had been teachers at Hilltop High School (one through the ROP) and were part of the academy's original planning team. In preparation for the pilot year, the team began to market the academy to middle-school principals and counselors as part of student recruitment efforts. The team also started to recruit and train additional academy instructors, and develop curriculum for the program. The first class of 9th graders entered Hilltop High School's pre-academy in September 1996. The following year, as 10th graders, they became the first class of academy students.

At times, the road to implementation has been bumpy. Since the early planning stages, the school has had three principals. The academy has experienced turnover in its leadership, as well. When the curriculum-development co-director left Hilltop High School during the program's second year, the other co-director became the sole academy director; and the lead travel-and-tourism teacher, who had also served on the original planning team, took over many of the responsibilities related to curriculum development.

At about the same time, Hilltop High School began to develop a second academy—IT academy, which admitted its first class of students in September 2000. The travel-and-tourism academy's director became director for both academies.

The director of the two academies left Hilltop High School at the beginning of the 2001 school year, and the travel-and-tourism academy's lead teacher was asked to take over as the new director for both academies, in addition to her other responsibilities. The individual acting as lead teacher for the IT academy went on maternity leave in January 2002. For the remainder of the 2001–2002 school year, the director served as both lead teacher and director for the two academies.

Design

The career-focused course sequence for Hilltop High School's travel-and-tourism academy includes: introduction to computers, careers 2000, destinations, hospitality, computer applications, and marketing. While projects and lessons may have travel-related themes, the content for these classes is designed to provide students with opportunities to develop general workplace skills such as business communication and teamwork, rather than industry-specific skills, such as front-desk management or client services. Per NAF guidelines, schools have the option of staffing most of these courses with business, English, or social-sciences teachers. Hilltop High School chose to use academic teachers in these classes because it wanted to promote the academy as an academically rigorous program. The only career-focused courses that are taught by CTE teachers are the two computer classes.

At the Hilltop High School travel-and-tourism academy, students in grades 9 through 12 enroll in what the school refers to as travel-and-tourism English and travel-and-tourism social sciences every year. The majority of the curricula used in these classes do not relate to the academy's overall travel-and-tourism theme. However, the travel-and-tourism distinction is important. By designating certain sections of classes as travel-and-tourism classes, administrators are able to create a smaller learning community for a subset of students.

Students in the ninth-grade pre-academy also enroll in an introduction-to-computers class and a careers 2000 class. To promote consistent themes and academic rigor in the academy's overall ninth grade curriculum, the careers-2000 class is taught by the ninth grade travel-and-tourism English teacher. In addition to travel-and-tourism English and social sciences classes, sophomores take a destinations course, a travel-and-tourism health course, and biology. During their junior year, travel-and-tourism students take chemistry, a hospitality course, and a computer applications course, along with travel-and-tourism English and U.S. history. Required classes for seniors include travel-and-tourism English and social sciences, and a marketing class. The

marketing class is taught by a social sciences teacher again to promote consistency in themes and academic rigor. All academy students also take 4 years of math.

Most of the curriculum integration that occurs within the Hilltop High School travel-and-tourism academy involves project-based learning activities that create links between lessons in English and social sciences classes. English and social sciences teachers work together in teams to identify areas of overlap between their curricula, and develop activities that will help students see the relationships between what they are studying in these classes. Then, instruction is provided separately by each teacher.

Ideally, projects or activities also relate to the overall travel-and-tourism theme of the academy. For instance, in one coordinated English and social sciences activity, juniors were asked to plan a trip on a train that started in the eastern U.S., and headed west. As part of this project, students needed to identify 10 stops that the train would make. For each stop, students were assigned to discuss relevant literature in their English classes and historical events in social sciences classes. One student used a stop in Salem, Massachusetts, to discuss *The Crucible* by Arthur Miller, and related the Salem witch hunts to the Red Scare and McCarthyism.

In other examples of how teachers created projects with travel-and-tourism-related themes, the 11th grade U.S. history teacher asked students to research museum exhibits in preparation for a discussion of how different time periods or events in history are portrayed. Students studied diseases in other countries as part of the curriculum in their health class, and looked at how health issues affect foreign travel (e.g., potable water, vaccinations).

In order to provide students with opportunities for work-based learning, the junior year has a mentoring component, in which students are paired with mentors in the travel-and-tourism industry. Students also participate in job shadowing and field trips. Approximately a third of the academy's students complete paid internships generally between their junior and senior years. The school also tries to be flexible in scheduling to accommodate students who want to participate in internships during their senior year. The computer applications teacher oversees the internship component of the program, and students can earn vocational credit upon successful completion.

Context

The California Partnership Academy grant currently provides the Hilltop High School travel-and-tourism academy with approximately \$81,000 each year. The school uses these funds to pay for professional development activities, support curriculum development, and cover the lead teachers' and director's salaries. They are also used to pay for field trips and provide rewards for student achievement. Hilltop High School's administration indicated that without this additional financial support, there would be no academies.

Very little overlap exists between the lessons and activities that take place in the academy's academic classes and those that take place in what are considered to be the more career-focused courses. This is despite the fact that, per Hilltop High School's implementation of NAF

guidelines, academy English and social sciences teachers deliver most of the career-focused instruction.

New graduation requirements were cited by teachers and the academy director as one of the biggest challenges to more in-depth curriculum integration. All students must meet California's standards for academic learning, the Expected Schoolwide Learning Results (ESLR). In order to demonstrate that teachers in the district are covering the material that will enable students to meet the ESLR, the district mandates that all students complete an English portfolio at each grade level. According to the academy's director, academy teachers used to incorporate lessons and activities from the NAF curriculum into academic lesson plans to emphasize a point or show how an academic theory might be applied to solve a problem in the real world. However, there have been fewer and fewer instances of these kinds of activities, as teachers worry about preparing students to meet state learning standards and completing all of the requirements for the English portfolios. The academy's director has struggled to help teachers understand that interdisciplinary lessons, when designed and delivered correctly, both reinforce academic learning and address the state's academic standards.

Occasionally, an English teacher will include student writing assignments from a career-focused class in the district-mandated English portfolio, but these instances are rare. Academy teachers indicated that because the district designates subjects to be covered, it is difficult for them to even adapt travel-and-tourism related themes for their prompts or questions for portfolio writing assignments.

The academy's director is working with school administrators and academy teachers to recast the curriculum so that new state standards and course requirements are blended into the academy's instruction and sequence of courses. For example, one goal is the redesign of the academy's marketing curriculum so that the marketing class will also count toward a state requirement that students pass an economics course in order to graduate. The academy's director indicated that, in most cases, making the necessary adjustments to the curriculum will not be difficult; it will just take time—a scarce commodity for the academy's director and teachers. According to the director, academy teachers will work on enhancing the curricula at a workshop over the summer. Teachers are being given extra-duty pay to create curriculum infused with work-based standards in project-based learning, to support the director's goal of making courses more relevant to the academy's travel-and-tourism theme.

Despite some of the challenges involved in curriculum integration, the academy's director maintains a positive outlook for the coming year. In the early years, teachers were assigned to the academy. Over the past 2 years, the director has made it a priority to identify strong individuals with an interest in the academy, a willingness to embrace hands-on, contextual teaching and learning strategies, and the desire to work in partnership with other teachers on the team. With the addition of two new teachers, the director is very confident that the academy now has the right mix of personalities. Individuals have been identified to take over as lead teachers for the travel-and-tourism and IT academies. This will give the academy's director more time and energy to devote to strengthening the curriculum and further refining the programs.

Outcomes

Graduating seniors believed that participation in the travel-and-tourism academy will ultimately help them achieve their goals. Some indicated that they were more confident in their research skills. Several emphasized the value of knowing how to make presentations, work in teams, compromise, solve problems, and get a job. Others suggested that they had learned a substantial amount about business, marketing, and economics. Students believed that this knowledge would give them an advantage over their non-academy peers when applying for jobs in the real world, in any field or profession.

The principal noted that academy students are more stable. They have better attendance and retention rates than other students in the school. Academy teachers observed that academy students tended to grasp information and complete assignments faster than their non-academy peers, despite the fact that many of the academy's students are classified as being at-risk. One noted that academy students seem more concerned about what is going on in the classroom, and more engaged. Teachers attribute this, in part, to the fact that academy students, as part of a smaller learning community, receive more attention than their non-academy peers. Teachers suggested that, for some students, the links across the curriculum and project-based learning activities that are built into the academy model are critical to academic success.

Johnson County High School, Agriculture Program

Johnson County High School is a comprehensive high school located in Mountain City, Tennessee a very rural area in the northeast corner of the state. The high school serves approximately 800 students, with almost half enrolled in vocational programs. A high percentage of the overall student population is eligible for free or reduced-price lunch. There is very little diversity in the student body, with fewer than a dozen African-American and Hispanic students. Many students are not only first-generation college-bound, but will be the first in their families to graduate from high school.

Goals of curriculum integration

Curriculum integration activities at Johnson County High School are led by teachers in the agriculture department. For many years, they have been intentionally incorporating academic lessons into the agriculture curricula in an effort to prepare their students more fully for the future whatever it might hold. While the content of the primary curriculum integration activities has a vocational focus, it also contains progressively more sophisticated academic material. In some instances, agriculture teachers team with academic instructors in delivering the content. By doing so, the agriculture teachers are, in a sense, training academic teachers on how and when to use integrated curriculum to strengthen lessons in their classrooms. In time, the administration hopes that curriculum integration will become common practice for all teachers at Johnson County High School.

History

In the early 1990s, the agriculture program at Johnson County High School was very small, with just two teachers—one full-time and one part-time. Both were searching for ways to expose agriculture students to higher-level academic theories and concepts. After an FFA^{viii} trip to Epcot, the full-time agriculture teacher began encouraging his students to experiment with hydroponics in the school's small greenhouse, and the part-time teacher began an aquaculture program in a regular classroom filled with fish tanks.

In 1994, the superintendent of schools brought a state senator and a state representative through Johnson County High School to showcase the unique but at this stage, very rudimentary hydroponics and aquaculture activities. The senator and representative, impressed by the two teachers and the strategies they were using to challenge their students, began to lobby the state for money to expand the agriculture program at Johnson County High School. Through a combination of government grants and matching funds from the private sector, the new, high-tech facilities were completed in May 1997.

The new facility for agriculture studies at Johnson County High School is beyond compare. Students have access to an immense greenhouse. The facility also includes an aquaculture center where students use complex concepts of symbiotic engineering to raise tilapia (an African white fish often grown as food) and grow hydroponic lettuce, which they sell to markets and restaurants. In the past few years, the staff has grown from one-and-a-half teachers to four full-time teachers and two agriculture technicians.

During the 2000–2001 school year, more than 150 Johnson County High School students were enrolled in courses offered by the agriculture department. Course offerings include greenhouse management, hydroponics I and II, aquaculture I and II, horticulture technology, agriculture mechanics I, agriculture engineering, floriculture, forestry/wildlife, and agriscience.

Under the leadership of the department chair (the teacher who encouraged his students to experiment with hydroponics almost a decade earlier), all the teachers in the agriculture program have developed curricula that use the greenhouse and aquaculture-center environments to reinforce complex math (e.g., logarithms), science (e.g., anatomy), and social studies concepts on a regular basis. A student in an agriculture course will be exposed to structured curriculum integration several times a week, if not daily.

Design

What makes this curriculum integration different from the blended instruction typically found in vocational classrooms? As a matter of general practice, the agriculture teachers at Johnson County High School search for opportunities to teach their students academic subject matter beyond what is imbedded in the vocational content. While they use familiar examples of applying academic theories and knowledge to the vocational studies in the greenhouse and aquaculture center, the broader goal is to enable students to apply the concepts and theories in other areas of their lives not just to agriculture-related problems. In fact, a number of students

participating in a focus group indicated that they enrolled in the more advanced agriculture courses to increase their comprehension of higher-level math and science concepts.

In addition to the curriculum integration activities in the agriculture classes, the agriculture teachers, again at the urging of the department chair, pair up with academic teachers about 12 to 15 times a year to discuss and plan how to provide all students with a better understanding of how academic subject matter can be applied to achieve occupational goals. For instance, the vocational and academic teachers will combine their classes (e.g., horticulture and government, floriculture and pre-algebra). However, prior to combining classes, the two teachers will meet briefly to discuss relevant subject matter. Then one will take the lead in developing a lesson plan for the class, outlining academic and vocational instructional objectives. The other teacher will provide feedback on the plan. The two will continue to exchange ideas, refining the content to be covered during the class until both are satisfied.

The two teachers, as a team, will then deliver this material to their combined classes. For instance, when the horticulture and government teachers join forces, they often engage students in a discussion of government regulatory agencies and the regulatory process, using relevant examples from the agriculture industry. They discuss the roles that the Environmental Protection Agency, the Food and Drug Administration, and the Department of Agriculture play in protecting consumers from harm. Students are asked to debate the costs and benefits of legislation such as the Food Quality Protection Act, from both consumer and industry perspectives. The teachers build on this activity, explaining that legislators often engage in similar debates as part of the policy-making process. In assessments, each teacher has students reflect on what they learned.

According to the agriculture and academic teachers, most academic teachers are at-first reluctant to share precious class periods. Faced with preparing students to pass state-mandated high school exit exams, teachers worry about having enough time to cover all of the necessary material. However, academic teachers usually succumb to curiosity, and agree to participate in one joint class activity, because the agriculture program has received many accolades from school administrators, the community, and even students. After witnessing how engaged and enthused their students become during the combined class exercise, upon seeing the real-world applications for academic studies, academic teachers frequently approach vocational teachers, seeking out information on curriculum integration and additional opportunities to work together.

Context

Because the program is located within a comprehensive high school, vocational and academic teachers face fewer logistical barriers when they want to design combined lesson plans than they would if vocational classes were offered off-site. All teachers are given a 90-minute planning period each day. The principal is an ardent believer in curriculum integration, and the administration encourages teachers to use this time to interact, and coordinate plans and activities.

Creating a heightened awareness and acceptance for curriculum integration among academic teachers is one of the primary challenges to developing the practice further at Johnson County

High School. The principal has been attempting to provide both academic and vocational teachers with models and professional development to help them better understand curriculum integration. For instance, math, science, and vocational teachers recently attended a 2-day conference where they reviewed competencies and standards for algebra and biology. The faculty used the lessons from the conference to revise existing curriculum to include integrated activities that address both math and science competencies and standards.

The principal frequently asks staff to present at faculty meetings on recent curriculum integration activities. The purpose is two-fold: first, to recognize participating teachers for their initiative and innovation; second, to make other teachers aware of alternative methods of instruction, emphasizing the power of curriculum integration.

According to the principal and school faculty, it helps that the impetus for curriculum integration came from within the school. Teachers elsewhere frequently find themselves forced or encouraged to incorporate programs from the outside into their classroom activities. While these programs are well intended (e.g., DARE), some activities cannot be integrated easily into academic lessons, and many teachers believe that these activities distract from critical academic instruction. With the curriculum integration that the agriculture and academic teachers are trying to build, the faculty is working together to develop ideas they believe will ultimately improve the way they teach students strengthening their ability to carry out their mission.

Outcomes

In the past few years, more students are registering for agriculture department courses, and there are, in fact, waiting lists for some of the classes. More than 50% of these students are preparing for studies at postsecondary institutions upon high school graduation. Students report that the courses offered by the agriculture program provide not only an opportunity to explore a wide variety of careers in the agriculture industry, but also serve as a form of college prep. Of note, records at the school show an increase in the number of students who are enrolled in both agriculture classes and higher-level math classes.

Curriculum integration activities are helping to build and strengthen relationships between the academic and vocational faculty. According to one academic teacher, “Academic teachers used to refer to the vocational programs as ‘vacation land,’ thinking that the courses were easy. After collaborating with the vocational teachers, we have gained a new respect for how hard they work, and how rigorous their programs are.”

Faculty and administrators at Johnson County High School have just begun to track the results of curriculum integration activities. Based on preliminary data, they suspect that curriculum integration will result in improvements to test scores on state-mandated high school exit exams.

Lansing Area Manufacturing Partnership

Launched in 1997 by the United Auto Workers–General Motors Center for Human Resources (CHR), the Lansing Area Manufacturing Partnership (LAMP) is a union–employer led curriculum integration effort. In cooperation with the Ingham Intermediate School District

(IISD), the United Auto Workers (UAW) and General Motors (GM) developed and piloted a school-to-career program designed to provide young people with exposure to all aspects of the automotive manufacturing industry.

Students attend LAMP for 2 1/2 hours every day during their senior year. The LAMP classroom enrolls students with different ethnic, gender, socioeconomic, and academic backgrounds from 25 high schools and 3 school districts.

Goals of curriculum integration

Faced with an aging workforce, CHR needed a way to generate interest among and prepare high school students for careers in the automotive manufacturing industry. Advances in technology have greatly changed the nature of the work, and leaders at CHR were concerned that young people might not be acquiring the kinds of general employability skills (e.g., teamwork, problem solving, critical thinking, interpersonal communication) needed for employment in the industry. They also wanted to make guidance counselors aware of some of the new and challenging career opportunities available in the automotive manufacturing industry, and encourage them to steer interested young people in that direction.

CHR decided that in order to have the desired influence on educational practice, it would need to create a program where a select group of teachers would demonstrate how to use innovative instructional strategies to prepare young people for work. Once these techniques were tested and proven effective, CHR hoped teachers at schools across the country would begin adopting them into everyday practice.

History

Originally, CHR planned to use the curriculum developed for the Ford Academy of Manufacturing Sciences (FAMS) as the foundation for its new program. Upon closer examination, the FAMS curriculum was not as integrated as CHR and the IISD, CHR's school partner, hoped it would be, and did not align fully with program goals. As a result, CHR needed to create a curriculum for the program. The summer before the first class began, two curriculum developers from the IISD led 10 IISD teachers and 12 UAW–GM subject-matter experts in a massive effort to develop an integrated curriculum for use in the LAMP classroom.

Because CHR and IISD leaders were still struggling to come to consensus on a clear set of objectives for the program that summer, the curriculum produced as a result of this effort was not cohesive. It had to be revised considerably by the two IISD curriculum developers in just-in-time fashion over the course of the 1st year.

The first LAMP classes met in the fall of 1997, and 21 students successfully graduated from the LAMP program the following spring. By the fall of 2002, the program had almost tripled in size. Based on instructor and student feedback, the program evolved considerably. Curriculum developers and LAMP instructors report that the academic and vocational content is now more tightly woven, and the program contains more opportunities for work-based learning.

Design

The LAMP curriculum comprises six units of study, integrating state-defined academic standards and employability skills within a manufacturing context. While studying manufacturing-related concepts such as systems, human resources, business principles, design, manufacturing process, quality control elements, students also use theories and lessons from academic subjects, including math, science, language arts, and social studies. For example, as part of LAMP's Quality Improvement unit, students learn to apply problem-solving tools typically used in the manufacturing workplace, such as Pareto charts, control charts, and scatter diagrams. In The Catapult exercise, students practice using a formalized problem-solving approach that models workplace practice, while introducing the mathematical concepts of variation and regression to the mean. Students construct a catapult and launch plastic golfballs at a target. They collect data on where the golf balls land, and use that information to reduce variation in the mechanism. Through this integrated exercise, students learn manufacturing concepts, transferable problem-solving, and applied statistical analysis.

A trio of certified instructors shares classroom responsibilities. Drawn from local school districts, they have backgrounds in math, science, communication, and business. Team teaching makes it possible for teachers to model teamwork. In addition, by offering varying perspectives on curriculum content, the teachers provide a seamless delivery of both academic and vocational instruction in the same lesson. For example, if two of the teachers were presenting a lesson on customer service, one might provide a definition of customer service as it appears in the curriculum (the academic concept). He or she might go on to provide the historical context of how customer service came to be valued as a goal by business (the historical business perspective). The other teacher might provide specific examples drawn from real life, including examples of customer service from the teacher's perspective and from GM's perspective (the applied perspective). He or she might have teams role-play customer interactions for the class, and have the class critique the interaction (a hands-on, interactive, constructivist perspective). One of the teachers might provide further conceptual information for example, the perspective of a customer-service chain in which each worker is both a provider of service and a customer for service. Then the sequence repeats, with historical context, applied reality based examples, simulation, and group discussion. In this way, the curriculum content is delivered in varying ways, and each teacher is able to provide the students with a slightly different viewpoint often based on personal experience but always linked to actual, real-life application. The result is that students have a more complete understanding of customer service, having observed it from a number of perspectives.

Throughout the year, student progress is assessed along traditional academic dimensions, as well as by employment competencies. Students demonstrate knowledge through traditional paper-and-pencil tests and written assignments, but are also graded on team presentations and teacher observations. The course of study culminates in a Capstone Experience in which teams of student's research authentic workplace problems using the skills they developed throughout the year. They present their findings to an audience of educators, parents, and workplace personnel using multi-media in a simulated professional workplace presentation. Most of the participating high schools give students 2–3 elective credits for their LAMP experience; however, some schools

also award students .5 credits that can be applied toward graduation requirements in English/communication.

Context

Lansing, Michigan, is an ideal environment for the LAMP project. Home to some of the nation's oldest automotive plants, Lansing is definitely a "GM town." Traditionally, Lansing has a reputation for strong labor-management relations. Both UAW and GM provide essential support to the program through considerable investments of in-kind and financial resources. This mutual support would not be possible without a solid history of labor-management cooperation.

The IISD, seeking ways to tie classroom learning to real world experiences, has been an enthusiastic partner with the CHR from the start of the project. This was important; because the IISD was intimately involved in curriculum development, administrators at the sending high schools appear confident that the curriculum is academically rigorous, which makes it possible for them to endorse the program's off-site location.

Having an employer champion curriculum integration efforts produces a number of noteworthy advantages. The program is extremely well funded, as previously mentioned, with substantial financial and in-kind support from GM and UAW. The LAMP classroom is housed within a UAW-GM Training Center placement that is very significant symbolically, culturally, and educationally. It affords students easy access to different manufacturing facilities, resources, and numerous workplace personnel. Because the classroom is located at a worksite, students have many opportunities to see the application of classroom lessons and to interact with adults in a work environment.

Outcomes

The curriculum and instructional methods used in the LAMP classroom strongly encourage students to combine an understanding of manufacturing concepts and employability skills with academic knowledge to solve theme-based lessons and complete team projects. Students learn through a combination of classroom instruction, work-based learning, hands-on experiences, team projects, and interactions with UAW-GM personnel, including mentors. These are all techniques that CHR intended to model for schools, hoping they might be incorporated into common practice.

A study is underway to track three cohorts of LAMP students (the classes of 1998, 1999, and 2000) and corresponding groups of comparison students to determine the long-term effects of program participation. Early findings suggest that LAMP students are attending postsecondary education at higher rates than their counterparts. Additionally, more LAMP students are attending postsecondary training and working. LAMP students are earning higher wages than their non-LAMP peers, yet remain less satisfied with their employment situations overall. GM has hired approximately 25% of program completers.

The superintendent of the IISD reports that the school district is considering other partners in additional career alliances, such as the health care industry, as a result of the district's experience with curriculum integration through the LAMP program. The superintendent is particularly

interested in “how to use and grow the LAMP model to other industry areas,” and believes that “curriculum integration is definitely one of the underpinnings.”

Phoenix Union High School District

The city of Phoenix, Arizona, is growing rapidly. While the travel and recreation industries still account for a significant portion of the economy, the high-tech industry is also on the rise. The Phoenix Union High School District comprises nine comprehensive high schools and one magnet school, all of which are categorized as Title I schools. While slightly less than half of the student population participates in free or reduced-price lunch, the number of students eligible to participate is estimated to be considerably higher. Approximately 60% of the district’s 21,000 high school students are Hispanic. Approximately 20% are categorized as Limited English Proficient. As evidenced by recent test scores on the Arizona Instrument to Measure Standards (AIMS) test, student achievement levels are low. As a result, the state is requiring the district to work with an outside contractor to develop and implement plans for large-scale school improvement.

While students may take keyboarding during their freshman year and a career-exploration course during their sophomore year, more focused vocational studies do not generally begin until the junior and senior years. All nine comprehensive high schools in the district offer vocational courses. The magnet school, Metro Tech High School, serves as both a vocational center for the district and a comprehensive high school for students who intend to pursue postsecondary training and careers in vocational areas. All district career and technical education activities are administered out of the Career and Technical Education (CTE) office at Metro Tech High School.

Goals of curriculum integration

Since the early 1990s, administrators in the Phoenix Union High School District have been attempting curriculum integration as a strategy for infusing academic content into vocational curricula. Initial efforts were undertaken as part of the district’s response to Perkins II requirements. Administrators believed that integrating academic lessons into the content of vocational programs would raise both expectations and academic achievement levels for vocational students.

In more recent years, CTE staff have been working to strengthen students’ writing skills by integrating writing lessons into the vocational curriculum. CTE currently has three English resource teachers on staff who work with vocational teachers to incorporate lessons on sentence structure, punctuation, spelling, and vocabulary into vocational content areas. Extra support and practice in writing skills have become especially important, as students face new high school exit exams. Students must demonstrate proficiency in six writing traits in order to pass the AIMS tests. Resource teachers help vocational teachers develop curriculum integration.

History

In its Perkins II application, the Phoenix Union High School District outlined a plan for providing vocational teachers with access to resource teachers from different academic subject areas who could help identify strategies to support academic learning through vocational instruction. In this manner, the district hoped to integrate academic lessons into the curricula from multiple vocational areas in all of the high schools across the district.

At the outset, the district hired one English resource teacher, one science resource teacher and another for math. The program manager in charge of the Perkins grant knew she needed to gain buy-in from vocational teachers as a critical first step. A series of workshops was conducted to introduce vocational teachers to new staff, strategies, and expectations.

Initially, resource teachers and vocational teachers were to work together to develop lesson plans that would link academic and vocational content, and then, as a team, provide instruction to the class. However, the CTE supervisor (who was the Perkins II grants manager at the time) noted, “What works, and what doesn’t work, depends on the people in the positions.”

For instance, the original science and math resource teachers never seemed to understand their roles fully. They were frequently creating their own lesson plans, and delivering them as isolated units. The English resource teacher seemed to be the most successful in following the model. She understood how to work with vocational teachers to strengthen students’ writing skills through vocational lessons and activities. Eventually, the math and science components were dropped because teachers with the right combination of vision, skills, and personality could not be found to staff the positions. At the same time, more vocational teachers began to request support from the English resource teacher, and this component began to grow, to include three teachers.

From 1994 to 1999, the CTE office also implemented a summer curriculum integration project at Metro Tech High School. Classes were designed to support integration between specific academic subjects and vocational areas. Because there was a smaller number of students involved, administrators had more control over scheduling and other conditions. Teacher teams were given common planning periods to work together on designing integrated lessons and projects. At that time, Metro Tech High School was the only school in the district offering summer school, and was thus able to set a strict attendance policy and high expectations for participation and behavior. When the district’s leadership decided to give all district high schools money to run their own summer school programs, most students chose programs with fewer rules. Eventually, not enough students enrolled in the Metro Tech summer program to justify its continuation.

Having witnessed how engaged their students became in learning academic material when it was presented in a vocational context, many of the academic teachers who participated in Metro Tech High School’s integrated summer school activities returned to their classrooms in the fall prepared to explore curriculum integration with colleagues in their respective high schools. They quickly found that scheduling complications made it difficult for teams of teachers to share groups of students.

Throughout this period, the CTE supervisor continued to work with vocational teachers on developing curriculum integration activities through the workshops and resource teachers. With the state stressing academic standards, the district is now focused on making sure that students have the academic knowledge and skills needed to pass high school exit exams. Vocational teachers increasingly seek assistance from the English resource teachers in order to assure their students are prepared to pass the writing components of the AIMS tests.

CTE leaders have considered trying to revive the math component of the curriculum integration activities, but the challenge is finding the right person particularly when the district is short of math teachers. As a result, the CTE office is even more hesitant to make an investment in reviving the integrated math component because they know that the math resource teacher could be pulled back into a regular classroom with little or no notice.

Design

In 2001–2002, the Phoenix Union High School District received approximately \$2.8 million under Arizona’s Perkins III grant, and most curriculum integration activities are funded using Perkins monies. Through one-on-one interactions with resource teachers, structured workshops, and vicarious methods (e.g., picking up a new technique from a colleague who has attended a workshop or worked with one of the resource teachers), the district’s curriculum integration efforts are estimated to have affected the instruction of about 75% of vocational classroom teachers in the district.

The CTE office holds several workshops each year to introduce vocational teachers to both the concept of curriculum integration and the kinds of assistance the English resource teachers can provide. Program staff suspects that vocational teachers might be hesitant initially to seek assistance from the resource teachers because they are reluctant to give up ownership of their classrooms. Others, not accustomed to sharing their classrooms with another teacher, are not sure how to team-teach with the resource teachers. Through the workshops, the resource teachers and CTE staff work with teachers from the same industry area, but different high schools, on developing content and activities for strengthening students’ writing skills, and creating prompts or test questions to assess students’ competency in different writing skills or progress toward mastery. In addition, new vocational teachers are introduced to the resource teachers as part of the district’s orientation process. As vocational teachers gain familiarity with strategies for curriculum integration and the CTE staff, they seem to become more comfortable with the idea of working one-on-one with a resource teacher.

Each of the three English resource teachers works with vocational teachers at two or three of the district high schools. Prior to joining the CTE staff, all three were English teachers within the district, and they still have informal connections with their respective English departments. Through these networks and participation in departmental staff meetings, they stay abreast of issues and share information, but otherwise have few opportunities to work with other English teachers.

Each English resource teacher usually assists the same class of students four or five times a semester. In general, after working with a vocational teacher once, a resource teacher develops a follow-up schedule for building on the initial activity. For example, one of the teachers has been working with students in a culinary arts class on setting and achieving specific writing goals through a series of six short exercises every 2 weeks. They watch digitized video clips of chefs preparing food, and write descriptions of what the chefs are doing. The culinary arts teacher works with the English resource teacher to develop assignments that focus on organization and content, including topic sentences, details, and conclusions. The resource teacher reviews the work, and then meets with students one-on-one to discuss strengths and areas for improvement.

All teachers in the district have one planning period each day. The resource teachers have flexible schedules for meeting with vocational teachers. Resource teachers and vocational teachers also communicate through phone calls and e-mails.

The CTE supervisor understands that new resource teachers have substantial learning curves, and need time to build relationships with, and win the trust of, vocational teachers. Because the resource teachers are frequently at their assigned school sites and rarely in their shared office space at Metro Tech High School, they make it a point to meet together regularly to share insights, strategies, and activities, frequently borrowing lessons and projects from one another. Most of their professional development comes through research, colleague interactions, and conferences.

In addition to providing workshops and assistance by resource teachers, the CTE staff has designed a writing assessment activity that encourages communication and builds relationships among teachers from different disciplines within the same school. Since 1994, all vocational students have been required to take a writing assessment at the end of each school year. Students are given a question or problem relating to their vocational area, and asked to describe a solution in one or several short paragraphs. For instance, a student in a truck and diesel class might be asked to describe how to change the oil in a '57 Chevy.

Because of their respective knowledge bases, vocational teachers are paired with English teachers to score the writing assessments. CTE staff hopes that after this initial interaction, the teacher teams will see connections in their course materials and take the initiative to explore additional opportunities for developing curriculum integration activities on their own. CTE staff observed that academic teachers seemed to gain a new respect for vocational teachers as a result of the joint scoring activity. In some cases, English teachers have borrowed vocational teachers' prompts after grading the assessments, realizing that students seem better able to demonstrate their writing skills when responding to the carefully designed, vocationally based assessment questions.

Context

The CTE staff needed to identify a strategy for overcoming the barriers associated with efforts to integrate curricula across multiple vocational areas in multiple high schools. Administrators decided that the best way to create consistency in classrooms across the district was to identify and assign resource teachers in different academic areas to work with vocational teachers on

developing integrated curricula. For example, an English resource teacher may use the same curriculum integration strategy repeatedly, modifying it to incorporate industry-specific language or details, in several vocational classrooms across the district.

District and CTE administrators depend almost exclusively on Perkins monies to support curriculum integration activities. While they could not afford to sustain current efforts without Perkins funds, they believe that Perkins rules and regulations sometimes prevent them from taking additional steps that would foster more in-depth integration. For instance, because their salaries are paid with Perkins funds, the resource teachers are under the impression that they can provide only minimal assistance to academic teachers, even when asked.

The CTE staff observed that success often hinges on the perspectives and levels of engagement of district leadership. Over the years, some superintendents have taken steps to encourage collegiality among teachers across disciplines; others have not. In spite of changing priorities at the district level, this program has been able to adapt and endure.

Outcomes

At the end of the 2000–2001 school year, vocational students were assessed on the following writing traits: ideas and content, organization, and word choice. Approximately 75% of the students who took the assessment were proficient in the area of ideas and content, while 62% were proficient in both organization and word choice.

Students have come to expect that they will be required to do a fair amount of writing in their vocational classes. The chair of the business department at one of the high schools noted that students are more aware of their writing as a result of curriculum integration activities in vocational courses. The vocational teachers and high school English teachers who scored the most recent writing assessments also noted: “Students seem to be writing better.”

Given the current mandate to implement plans for large-scale school improvement, district leaders have developed a renewed interest in curriculum integration. While academic and vocational teachers still function in isolation from each other, district leaders have expressed an interest in using many of the activities developed by the staff at the CTE as models for curriculum development, assessment, and accountability efforts throughout the district.

Through a Definitional Lens

As discussed earlier, based on observations made during the first round of site visits, and after considerable reflection, debate, and discussion, the research team refined its definition for curriculum integration.

Revised definition: Curriculum integration is a series of *conscious and informed* strategies used to *connect academic and vocational content* so that *one becomes a platform for instruction in the other over an extended period of time*.

The revised definition attempts to delineate threshold criteria that must be present to distinguish curriculum integration from a wider range of efforts that link academic and vocational instruction in some way. This section uses practical applications from the seven sites to illustrate the major components of the definition, and to clarify why each component is important.

Conscious and Informed Strategies

Conscious and informed strategies are intentional efforts to include information beyond what is required for mastery of academic or vocational content. In the team's original definition, curriculum integration involved the incorporation of academic and occupational-career content, and instruction beyond what would normally be covered in the curriculum for the primary subject area. The new definition suggests that, while this is essential, the blending of academic and vocational content and instruction must also be strategic, deliberate, and planned.

Baylor College of Medicine (BCM), in setting up DeBakey High School, and the UAW-GM Center for Human Resources (CHR), in establishing the LAMP program, deliberately created models that would support students in both high-level academic attainment through vocational studies and vocational mastery through applications of academic knowledge. According to one UAW-GM subject-matter expert, "Once the curriculum teams began to work together, it just seemed logical that integrated curriculum would be the way to go. It was the best way to incorporate the practical experience provided at the plant with the academic skills necessary for future success." Because both efforts were undertaken in partnership with the local school districts, the academic content of the curricula is informed by the general course outlines and objectives used to guide teachers in schools throughout the districts. In each case, curriculum integration is theme-based, with teachers using the contexts of health care and manufacturing, respectively, to provide both vocational and academic instruction. Special efforts have been taken to define clear and strategic connections between academic and vocational material. For instance, LAMP's Catapult exercise provides students with instruction on a formalized problem-solving approach that models workplace practice while, at the same time, introducing them to the mathematical concepts of variation and regression to the mean.

Similarly, the minilessons in math, social studies, science, and English that occur as part of the every day classroom activities in agriculture courses at Johnson County High School are not coincidental, but the result of careful forethought and planning on the part of the agriculture

teachers. The Phoenix Union High School District's sole objective in creating the resource teacher positions was the development and support of curriculum integration. Likewise, the curriculum integration coordinator at Apex High School was already charged with facilitating the integration of CTE and academic classes. This coordinator proposed the idea of creating an IT academy because the NAF academy model provided the infrastructure needed to support more conscious and in-depth curriculum integration.

Interestingly, the travel-and-tourism academy at Hilltop High School is also an NAF academy. While the basic infrastructure for Hilltop's academy would easily support curriculum integration, meaningful links between CTE and academic instruction are limited. In implementing the model, the team at Hilltop was working toward a very different end. The academy team's objectives were to help students in the middle tier attain higher levels of academic achievement and provide them with opportunities for career exploration. They used the academy model to create a smaller learning community with an industry theme. Administrators were interested in connecting students' studies in English and social sciences classes, and made conscious efforts to create projects that would integrate these two academic subject areas. While these projects sometimes involve a travel-and-tourism related theme, the integration of career and academic information was never a primary goal of program developers. This model illustrates that while infrastructure is important, so is intent. While some overlap between the content of academic and CTE, or career-focused, classes occurs naturally, true curriculum integration cannot exist without conscious and informed efforts to blend academic and vocational instruction.

Teachers at the ESGVROP/TC make conscious efforts to recognize and emphasize the academic material in the vocational curriculum. They are even attempting to identify how and where the vocational curricula support state academic standards. Still, the ROP as a regional vocational center does not offer traditional academic classes for high school students, and no evidence suggests that lessons and activities occurring in students' vocational classes are connected in any way to academic instruction in the region's sending high schools. Because of the number of schools participating and the breadth of vocational areas covered, ROP teachers have few, if any, opportunities to coordinate with their students' academic teachers around content and instruction. As a result, the instruction that occurs in students' vocational classes happens largely in isolation of activities and lessons in students' academic classes, and, in general, academic instruction does not extend beyond what would normally be required for vocational mastery.

Without explicit intent to integrate academic and vocational curricula, these subject areas will remain largely, if not entirely, separate and disconnected. In addition, a closer examination of the barriers to curriculum integration at Hilltop High School and the ESGVROP/TC led the team to conclude that the presence of clearly defined and recognizable vocational and academic components is necessary in order for models to support conscious and informed strategies for curriculum integration. In the case of the ESGVROP/TC, the academic component is missing. Hilltop High School's travel-and-tourism academy sequence contains only two vocational computer courses, and the vocational instruction is not used to reinforce or inform academic instruction.

Connecting Academic and Vocational Content

Strategies that *connect academic and vocational content* usually result in content that is primarily academic with vocational elements woven throughout, or primarily vocational with academic elements woven throughout. In curriculum integration, the content can be neither purely academic nor purely vocational.

DeBakey and the Apex AOIT blend vocational concepts and skills into content that is primarily academic. After the changes that occurred in the late-1980s and early-1990s, DeBakey's mission became college preparation for students who would need postsecondary and graduate degrees to pursue careers in medicine. In order to help these students attain their goals, DeBakey also needed to provide them with basic, and then rigorous, instruction in health sciences and health occupations, as well as work experiences in a health care environment. Similarly, the content for the Apex AOIT was designed to prepare students to meet entrance requirements for both state universities and 2-year postsecondary institutions. Most parents in the Apex community expect that their children will attend a baccalaureate institution after high school graduation. Care was taken to design the academy so that it would be attractive to university-bound students and their parents. In addition, because the academy's core team of teachers includes three academic teachers and one CTE teacher, the focus of the content used in most of the academy's classes is academic.

LAMP, the Phoenix Union High School District, and the agriculture program at Johnson County High School weave academic elements into the vocational curricula. For example, the LAMP curriculum contains 6 units of study that, by design, integrate state-defined academic standards and employability skills within a manufacturing context. In both the Phoenix Union High School District and Johnson County High School, academic lessons are intentionally layered into the vocational curriculum. In Phoenix, English resource teacher's work with vocational teachers to incorporate lessons related to specific writing traits into vocational instruction and activities. Sometimes the resource teacher will lead the lesson, sometimes the vocational teacher will lead the class, and sometimes the teachers will provide instruction together.

Across the seven sites, the NIWL team was unable to find any instances where academic and vocational content were evenly balanced. The content for curriculum integration generally had either an academic or vocational emphasis. This led the team to consider whether it would be possible to create curriculum integration that contained equal amounts of academic and vocational content.

The LAMP curriculum developers, with their strategic selection and careful alignment of academic and manufacturing standards, came close. However, in implementation, the program's emphasis is clearly on manufacturing. While curriculum developers referenced general course outlines and objectives in designing the LAMP curriculum, they had the freedom to pick and choose among vocational and academic standards, combining them in a way that made sense. They were not constrained by the need to meet state or district academic and/or vocational course requirements, as was the case in the other six sites.

Serving as a Platform for Instruction

During the site visits, the research team observed several strategies for delivering academic and vocational content so that *one becomes a platform for instruction in the other*. In order for this to occur, instructors use examples from vocational coursework to teach academic concepts, so that students see uses and applications outside the vocational context in which the information and theories were originally presented. At the same time, instructors also use examples from academic coursework, so that students see real-world applications outside the academic–theoretical context in which they were originally presented. Under the team’s original definition, curriculum integration could entail the incorporation of academic material beyond what would be required for vocational mastery, or the presence of vocational material and references beyond what might normally be expected in academic instruction. Under the new definition, both of these scenarios occur simultaneously.

In DeBakey and the Apex AOIT, vocational instruction was intentionally blended into the content of academic lesson plans. For example, the physics teacher at DeBakey helps students understand the complex properties of light and sound using the mechanics of the eye and ear. At the AOIT, the biology teacher incorporates digital cameras, 3-D presenters, and graphics software into the students’ lab exercises. Students are required to demonstrate an understanding of the academic content of the labs, and also that they know how to use the technical equipment and software to complete an assignment. At the same time, students at DeBakey and the Apex AOIT explore academic concepts in their vocational classes. For example, in their health sciences classes, students at DeBakey must draw from lessons in math and English to work through scientific formulas and prepare reports. At Apex, as part of a programming class, students were required to create PowerPoint presentations and brochures with digital pictures, based on a trip to the zoo. Students did a cost analysis using lessons from their math class, and included findings in their brochures.

In LAMP, the Phoenix Union High School District, and Johnson County High School, classes are taught by teams of vocational and academic teachers. As each team presents the material, they layer in perspectives from their areas of subject matter expertise. For example, in Phoenix, vocational students will be asked to write a description of how to execute a vocational task. The English resource teacher will use these exercises to work with students on elements of grammar and organization, while the vocational teacher looks for knowledge comprehension and of vocational subject matter. In Johnson County, a social studies teacher might talk about federal regulations and the regulatory process, and then an agriculture teacher will use specific examples of how regulations affect greenhouse operations, to make the lesson real for the students.

Work-related learning opportunities were used to enhance both vocational and academic instruction at several sites. Seniors at DeBakey participate in preceptorships, spending two 3-hour class periods each week shadowing medical professionals in the workplace. At the end of each week, students discuss their experiences in a preceptorship class. These debriefing sessions give students opportunities to explore the connections between their academic coursework and their workplace experiences. Students in Johnson County High School are required to apply both academic and vocational knowledge to meet their obligations with respect to the maintenance and upkeep of the greenhouse and aquaculture center. Students in LAMP attend class every day

at a GM facility, and must show identification badges to enter just like GM employees; the manufacturing plant becomes a learning laboratory. Through these work-related learning opportunities, students experience first hand how problems are solved using a combination of theories, concepts, and skills from multiple disciplines.

A significant percentage of ESGVROP/TC students are given work placements, and vocational teachers check in with students' employers on a weekly basis to assess progress and address concerns. While vocational teachers are very much aware of what students are learning in their work placements, academic teachers are not. As a result, there are limited opportunities to tie students' work-site experiences to instruction in their academic classes.

In order to deliver vocational content through academic instruction, and academic content through vocational instruction, teachers in the sites visited for this study had incorporated strategies such as project-based learning, work-based learning, and team teaching into regular classroom practice. In most cases, they required targeted professional development to help them become comfortable with unfamiliar content and new instructional methodologies.

The Relationship Between Content and Instruction

While content and instruction were discussed separately above, it is important to recognize that in order for meaningful curriculum integration to occur, content, instructional delivery must be interrelated. Integrated content alone is not sufficient to produce curriculum integration. Similarly, without integrated content, theme-based instruction, team teaching, and work-based learning are simply delivery mechanisms. Curriculum integration requires both content that blends academic and vocational concepts, and the use of appropriate instructional strategies.

In LAMP, for instance, the content of the curriculum, which addresses both state-defined academic standards and industry-defined manufacturing competencies, is delivered through a combination of classroom instruction, project-based learning, job shadowing, and plant tours. Students go into the plants, and see applications and relations with and among the concepts they learned about in class. In Phoenix, resource teacher's work with vocational teachers to develop and deliver integrated lessons. AOIT teachers create interdisciplinary projects that use quarterly off-site field trips as a focal point for curriculum integration. For example, after students went on a field trip to see the ballet *Romeo and Juliet*, they developed marketing plans for the ballet. They used technology to prepare promotional materials, math to figure out the costs and benefits of different marketing strategies, and biology to explore the physiological aspects of dance. Likewise, teachers at DeBakey use project-based learning, group activities, and work-based preceptorships to teach both academic and health-related subject matter. One year, students were asked to examine the health, social, and economic impacts of the Ebola virus. The Ebola virus and the cultures of Africa became the themes for most of the courses. For example, in economics classes, students studied the economic impacts of the virus and other health issues, from an historical perspective.

Extended Period of Time

While short-term projects can provide program operators with a starting point, when curricula are truly integrated, strategies that connect academic and vocational content are reinforced repeatedly through continued activity *over an extended period of time*. After the first round of site visits, the team realized that curriculum integration involves a series of related and progressively more complex activities that require students to use and build on academic and vocational knowledge. For example, DeBakey is designed to provide progressively more in-depth and complex study of the health care industry over a 4-year period. The AOIT is also designed as a 4-year program, with increasingly sophisticated CTE courses and subject matter.

Students in the LAMP program are exposed to curriculum integration with a manufacturing theme for an entire year. According to one of the UAW subject-matter experts who was involved in developing the curriculum, “No single unit can be delivered on its own. The learning points reinforce concepts from earlier units, and the training builds upon itself.” The LAMP program culminates in a Capstone experience, in which students are required to draw from lessons in math, science, English, and social studies, as well as knowledge of quality control, labor history, manufacturing processes, and systems, to present solutions to real problems in GM plants.

Students in Johnson County and the Phoenix Union High School District are involved in curriculum integration activities several times a semester. For example, after making an initial contact, the English resource teachers in Phoenix generally work with vocational teachers to develop a series of integrated lessons and a schedule for instruction. Each lesson is designed to serve as a foundation for the next. Both the agriculture teachers in Johnson County and the English resource teachers in Phoenix model curriculum integration for their colleagues, with an eye toward teaching them how to develop projects or activities so they can eventually take the lead in initiating curriculum integration efforts with other teachers in their schools.

The Importance of a New Definition

The NIWL team’s original working definition lacked important details and, as a consequence, was too broad. For instance, it did not capture the importance of intent. Efforts to integrate academic and vocational curriculum must be conscious and informed. They must fit into a larger strategy and/or sequence for instruction. Perhaps of even more importance, the team realized that in order to connect academic and vocational content in a conscious and informed manner, models must contain explicit vocational and academic components. While the content and instruction of most curriculum integration efforts tend to be more heavily weighted toward one or the other, both must be clearly defined and equally valued. Finally, previous work in curriculum integration did not distinguish between one-time projects or activities that blend vocational and academic instruction and ongoing efforts in which each lesson serves as a precursor for the next. Curriculum integration needs to be a series of conscious and informed strategies used to connect academic and vocational content, so that each becomes a platform for instruction in the other over an extended period of time.

Under NIWL’s revised definition, curriculum integration could be characterized as a double-helix with academic content and instruction regularly linking vocational content and instruction.

Having a clearer definition of curriculum integration is important because it provides researchers, policy makers, program developers, and practitioners with a common framework and language to use as the basis for future work.

Curriculum Integration in Context

This study began with an exploration of the relationship between the driver, or catalyst, of a particular curriculum integration effort, and the scope and quality of that effort. Preliminary findings suggested a need to focus more broadly on the context in which integrated curriculum initiatives are implemented. It became apparent that the context for curriculum integration is more of a factor in determining outcomes than the NIWL team originally anticipated. The team identified two kinds of contextual factors—structural and operational. Structural factors and operational factors are interrelated, shaping multiple aspects of design, development, and implementation.

In order to demonstrate how the context affects the nature of curriculum integration efforts, this section of the report examines the structural components and administrative circumstances that facilitate effective integration of academic and vocational education at the secondary level.

Key Structural Features of the Context

The data collected during the site visits suggest that the structural features of the seven models can be characterized as:

- a single-industry-focused, comprehensive high school (DeBakey);
- a single-vocation focus within a comprehensive high school (Apex High School’s AOIT, Hilltop High School’s Travel-and-tourism Academy, and Johnson County High School);
- a single-industry-focused, off-site program with participation from multiple districts (LAMP);
- a multiple-vocation-focused, off-site program with participation from multiple high schools (Phoenix Union High School District); and
- a multiple-vocation-focused, off-site program with participation from multiple schools in multiple districts (ESGVROP/TC).

The NIWL team found three key features of the structural context that, when combined, appear to create an optimal framework for initiating and sustaining curriculum integration. They are a single-industry theme or focus, co-location of academic and vocational instruction, and a single-school setting. This next section explores the impacts of focus, location, and the number of schools involved on curriculum integration efforts, and explains why the aforementioned features provide a more conducive environment for curriculum integration than others do.

Focus: Single-Industry or -Theme Versus Multi-Vocational Programs

Curriculum integration appears to become more difficult in settings that are focused on multiple occupational areas, as opposed to a single industry, theme, or pathway. The findings suggest that it is relatively easy for an English, science, or French teacher to link content and instruction with

a single occupational area such as manufacturing or agriculture. For example, in programs with a single-industry focus, teachers can use industry examples and vocabulary that have relevance for all students in the program because all share the same general vocational interest. It is exponentially more difficult to tie a single academic curriculum to multiple-career and -technical programs or courses. To incorporate appropriate occupational knowledge into the subject matter, an academic teacher would need to become familiar with the subject matter from a variety of industry areas, and work with vocational teachers from each of the relevant departments to develop appropriate content and instruction strategies. Still, it would be nearly impossible to develop lessons with industry-related themes or examples that would engage all students in a class if the students had mixed vocational interests.

In five of the seven sites—DeBakey, LAMP, the Johnson County High School agriculture program, the Apex AOIT, and Hilltop’s travel-and-tourism academy—curriculum integration efforts revolved around a single-industry focus or theme. In the other two sites—the ESGVROP/TC and the Phoenix Union High School District—curriculum integration involved multiple industry areas.

In the case of DeBakey, the single-industry theme or focus is health care. When academic teachers apply for positions in the math and English departments at DeBakey, they understand that the environment has a health care orientation. While the degree of curriculum integration may vary depending on the instructor, it is clear that each is expected to layer the health care orientation into their lessons and instruction, in coordination with other educators at the school. In the LAMP program, all curriculum relates to manufacturing. Teachers use theories and lessons from math, science, language arts, and social studies to explain manufacturing-related concepts such as systems, human resources, business principles, design, manufacturing process, and quality control elements. Because curriculum integration efforts at the Johnson County High School were initiated by the agriculture teachers and occurred either in or in conjunction with agriculture classes, the curriculum integration had a naturally occurring single industry focus. At both Apex and Hilltop high schools, decisions around an industry focus for their respective academies were determined, in large part, by the predominance of the IT and travel-and-tourism industries in the local economies. Occupational or career classes and curriculum integration efforts have IT and travel-and-tourism themes. The academy model supports smaller learning communities with single-industry foci.

In contrast, the ESGVROP/TC has a multi-vocation focus by law. It must provide students with access to occupational training in a variety of areas, and the superintendent and school staff must work within these constraints when considering strategies for curriculum integration. There is no common theme, making it difficult for academic teachers at students’ home schools to find industry examples to use in demonstrating real-world applications for academic theories and concepts that have relevance for an entire class, because students are studying in a variety of occupational areas.

The Career and Technical Education (CTE) staff in the Phoenix Union High School District uses an innovative approach to integrate academic curricula with multiple vocational areas. The Phoenix model brings academic instruction into vocational classrooms. The CTE division employs academic resource teachers whose primary responsibility is to work with vocational

teachers on integrating academic and vocational instruction into the course content for vocational classes. Because the resource and vocational teachers work as a team to design integrated lessons, resource teachers can rely on vocational teachers' subject-matter expertise. For instance, a resource teacher will work with a business teacher to integrate English lessons into the curriculum for the business class, or a culinary arts teacher to integrate English lessons into the culinary arts curriculum. The model is structured so that resource teachers deliver academic instruction to a class of students with a common vocational interest. In this way, they are able to overcome the need to use examples and vocabulary from a number of different occupational sectors during the same class period a challenge that many academic teachers working in more traditional classroom environments face when attempting integration.

In general, curriculum integration that involves only one industry or theme appears much more feasible than efforts that attempt to cut across many themes or industry areas. However, curriculum integration efforts that involve more than one vocational subject area can still be successful, as the Phoenix example illustrates. The key is to develop an infrastructure that supports the delivery of academic content through vocational instruction to groups of students with similar vocational interests or through their vocational classes.

Location: On-Site Versus Off-Site Programs

Based on observations made during the site visits, practitioners seem to have considerable difficulty in supporting curriculum integration when students receive regular academic instruction in one location and vocational instruction at another location. Curriculum integration appears to be more effective when both academic and vocational instruction occur at the same site.

When academic and vocational instruction occur at the same facility or school site, there are more formal and informal opportunities for vocational teachers and academic teachers to communicate and collaborate. As a result, academic teachers might gain a heightened awareness of what students are working on in vocational classes and, subsequently, be more likely to include themes or examples from industry to illustrate the application of academic theories or concepts. The findings suggest that when students are pulled out of their home high schools for vocational instruction, teachers struggle to connect the off-site instruction and content to lessons in the students' regular academic classes and programs. Physical separation between vocational and academic teachers seems to make planning and delivery difficult.

DeBakey is a theme-based comprehensive high school. Both academic and vocational instruction occur within the same building. In addition, because the school is located at the Texas Medical Center, students and teachers are immersed in the health care industry's culture and environment. They have regular access to medical facilities and are exposed to people in a variety of health care related professions further enhancing the connections between academic studies and their real-world applications.

In Johnson County, academic and vocational teachers are housed in two different buildings that located at the same site. Even though the catalysts in Johnson County faced few, if any, logistical barriers to curriculum integration, convincing academic teachers to participate remained a

challenge. The program's on-site location proved beneficial in overcoming this obstacle. Because the greenhouse and aquaculture center have generated so much excitement both with students and in the community at large, all teachers and administrators at the school have visited the facilities. A handful of academic teachers recognized early on that by working with the agriculture department to develop lessons that require curriculum integration, they could tap into students' enthusiasm for the activities in the greenhouse and aquaculture center, and use this enthusiasm to engage them in academic studies, as well. After seeing curriculum integration modeled, other academic teachers have become interested in exploring strategies and opportunities further.

Co-location of academic and vocational, or industry-related, instruction is a feature of the National Academy Foundation (NAF) model. In adherence to the model, vocational or industry-related instruction for the Apex AOIT and Hilltop High School's travel-and-tourism academy occurs on the high schools' campuses. The academy model facilitates communication among academy teachers, regardless of their subject areas, because academic and vocational or business teachers work as a team to support a defined group of students in a smaller learning community. At Apex High School, co-location also makes common planning and development of interdisciplinary projects more feasible.

In contrast, most ESGVROP/TC students attend academic classes at their home high school, and vocational classes at one of two off-site campuses. Vocational teachers have relatively few opportunities to interact with their students' academic teachers. As a result, a student's learning experiences at the ESGVROP/TC occur largely in isolation of learning experiences in the student's academic classes at the home high school. In an attempt to overcome some of the barriers to curriculum integration that distance creates, the ESGVROP/TC has hired career counselors to help students, academic teachers, and guidance counselors better understand how ROP courses can complement and reinforce academic learning. Toward this end, career counselors are attempting to facilitate more frequent interaction between academic and vocational teachers.

According to the team's definition, LAMP is technically an off-site program because students are pulled out of their home schools for instruction at the GM training facility in Lansing. Because many of the strategies used to deliver the LAMP curriculum involve work-related applications, the plant is the most logical location for the program. Teachers can provide students with hands-on experiences or demonstrate how academic and vocational material are used in actual work settings without having to waste valuable time and resources transporting students to and from work sites. As teachers were becoming familiar with manufacturing terms and concepts during the first few years of the LAMP program, GM personnel and UAW members serving as subject-matter experts were readily accessible when teachers needed clarification on the material. Now, teachers and students often spend part of the class period touring one of the plants or interviewing workers on the assembly line to learn more about a concept, and still have time to return to class for further discussion and instruction.

LAMP is unique because academic and vocational instruction are integrated within a single extended class in an industry setting. Still, LAMP administrators experience many of the same challenges faced by more traditional off-site programs in terms of connecting with academic

teachers at students' home schools when it comes to extending curriculum integration beyond the LAMP classroom.

In Phoenix, academic and vocational instruction occurs on-site for most vocational students at each of the district's nine comprehensive high schools. However, there are few, if any, ties to the instruction that occurs in students' academic classes. The resource teachers are housed out of the CTE office and are viewed as resources for vocational staff. It is the responsibility of the resource teachers, not the academic teachers in the high schools, to work with vocational teachers to incorporate English into vocational content areas. This holds true in Phoenix, regardless of whether vocational programs are located within the comprehensive high schools or off-site at the Metro Tech facility.

The model for curriculum integration used by the Phoenix Union High School District resembles the LAMP model in many respects. Both models are able to simulate an on-site location by using teams of vocational and academic teachers to provide vocational and academic instruction through vocational or industry-related classes. Students receive academic instruction through vocational lessons, with academic lessons tailored to strengthen students' skills in their chosen vocational area.

When academic and vocational instruction occur at the same site, teachers have both formal and informal opportunities to discuss and plan curriculum integration activities. Ideally, academic and vocational teachers will be located in the same building or on the same campus. However, when this is not possible, program developers can develop strategies to overcome some of the challenges created by the separation of academic and vocational instructors and instruction. Of note, in four of the seven sites—DeBakey, Johnson County, LAMP, and Phoenix—the majority of curriculum integration activities take place either on worksites or in vocational classrooms. Findings suggest that academic teachers may be more receptive to curriculum integration once they see academic theories and concepts applied in workplace settings.

Number of Schools Participating: Single School Versus Multiple Schools

The findings suggest that curriculum integration is a particular challenge for vocational high schools, programs, and regional tech centers that offer career and technical education to students from multiple high schools or districts. While it is difficult to create integrated curriculum that meets the needs of students with different academic skill levels within a single grade or school, it is nearly impossible for vocational teachers to coordinate curriculum and instruction with English, math, language, and social studies teachers in multiple schools or districts. To further complicate matters, not all building principals and district administrators understand the value of curriculum integration and/or how it can be used to strengthen both vocational and academic learning. Without administrative support, teachers may have a difficult time justifying efforts to incorporate seemingly unrelated vocational content into academic instruction.

DeBakey, Johnson County, Apex, and Hilltop High Schools are comprehensive high schools. In DeBakey and Johnson County, students in the same vocational studies generally share the same broad set of academic teachers. Throughout the year, teachers at DeBakey are given time to work together, to align coursework and plan projects. Each teacher at Johnson County High School has

a 90-minute planning period every day. The principal encourages academic and vocational instructors to use this time to interact with one another, and explore opportunities to coordinate activities and lessons. Within the academy framework, students in Apex High School's AOIT have a core team of teachers for English, math, science, and IT classes. Academy teachers at Apex High School have a common planning period to facilitate discussions and shared planning. Students in Hilltop High School's travel-and-tourism academy have a common team of teachers for English, social sciences, science, and business-oriented classes. In many cases, the business-oriented classes at Hilltop are also taught by English and social sciences teachers.

While supporting curriculum integration in a comprehensive high school setting has clear advantages, teachers may still face challenges to development and implementation. For instance, Hilltop High School's administrators struggle to provide academy teachers with the common planning time needed to coordinate integrated activities, given that the academy teachers also teach non-academy classes that must be worked into the master schedule. However, academy teachers frequently use their lunch period to discuss plans and student progress.

In contrast, LAMP has students from 25 different high schools in three different school districts. The ESGVROP/TC works with 7,000–8,000 students from 19 schools in seven different districts, and the Phoenix Union High School District includes nine comprehensive high schools and a magnet school.

When academic and vocational content and delivery are consciously linked within a single program, such as LAMP, it becomes possible to serve students from multiple schools. However, practitioners still struggle to overcome the challenge of extending the integration beyond the program and into the home schools of the students.

In LAMP, the CHR encouraged participation by multiple school districts in order to increase the number of teachers and guidance counselors exposed to the program. By working with the IISD from the outset to develop a curriculum that is part academic and part vocational, CHR limited the need for regular coordination with academic teachers at the students' home high schools. While the academic curricula used in the districts served as a foundation for the academic components of the LAMP curriculum, there are no direct connections between the instruction at the UAW–GM facility and academic instruction at students' home schools. Coordinating with academic teachers in 25 schools appears to be very difficult, if not impossible.

The vocational teachers at the ESGVROP/TC focus primarily on teaching vocational material, albeit with heightened emphasis on the academic skills identified in California's state standards. The superintendent and other administrators aggressively promote curriculum integration, and teachers are making a conscious effort to identify how their curricula can help students meet academic standards. Still, curriculum integration strategies are incorporated on a class-by-class basis, depending on a teacher's interest and ability. Primary responsibility for the transfer of academic knowledge remains with academic teachers at the sending schools; academic learning that occurs in the students' vocational classes is not generally connected with academic learning at the students' sending schools. The context that an ROP must operate in as a regional service provider makes curriculum integration more difficult.

The Career and Technical Education (CTE) staff in the Phoenix Union High School District sought to identify a strategy for integrating curriculum across multiple vocational areas in all nine comprehensive high schools and the magnet school in the district. Like LAMP and the ESGVROP/TC, staff focused their energies on supporting curriculum integration through vocational instruction. However, in Phoenix, academic resource teachers travel to the different school sites to deliver integrated instruction in students' vocational classes. When the teachers need to meet to discuss a classroom activity or develop a lesson plan academic resource teachers work around vocational teachers' planning periods. The CTE staff holds workshops for vocational teachers to help them understand the concept of curriculum integration and develop strategies on their own.

CTE has been effective in integrating English with the curricula from multiple vocational areas in all of the district's high schools, and, if they found the right individuals to serve as math and science resource teachers, could probably expand efforts to successfully integrate with math and science, as well. Still, the only activity that actually requires active participation on the part of academic teachers in the high schools is the annual writing-assessment scoring activity. CTE staff readily admit that this activity is designed to help academic and vocational teachers build relationships that might eventually lead to curriculum integration, but they do not expect curriculum integration to be the immediate outcome of these one-day meetings. As is the case in LAMP and at the ESGVROP/TC, curriculum integration in vocational classes generally occurs in isolation from related activities in students' academic classes.

It appears that curriculum integration is easier when the possible opportunities for coordination are limited to the teachers within a school. When multiple schools are involved, the number of individuals a teacher needs to work with grows exponentially. In addition, some schools may be more ready than others, making it difficult to implement a district-wide strategy at a single point in time. In some ways, both the Phoenix and LAMP models overcame the challenges of working with multiple schools by focusing on changing instructional practice at the classroom level. Teams of teachers, or in the case of LAMP, a team of UAW–GM subject matter experts and IISD curriculum developers worked together to tailor the curriculum to meet the specific needs of a particular class. This approach has its limitations; in both cases, curriculum integration does not extend beyond the classroom. Nonetheless, such efforts are much more manageable than when a single vocational teacher attempts to affect the instruction of or simply coordinate with multiple academic teachers at several school sites.

In summary, curriculum integration efforts appear to be most successful when programs are focused on a single industry, theme, or pathway. Coordination between academic and vocational teachers on subject matter also seems easier when curriculum integration activities happen in-house and involve a single school. The Apex AOIT, DeBakey High School, Hilltop High School's travel-and-tourism academy, and the Johnson County High School program all operated under these conditions.

Developers of both the LAMP and Phoenix Union High School District models were able to overcome the challenges of coordinating with academic teachers from multiple high schools. In LAMP, staff from the school district and subject matter experts from the UAW and GM developed the curriculum together, ensuring a balanced and complementary mix of academic and

vocational content. In this way, they were able to circumvent the need for regular communication between academic teachers at multiple high schools and LAMP teachers. The Phoenix Union High School District hired academic teachers to work with vocational staff on integrated academic and vocational instruction. These teachers actually bring academic instruction into vocational classrooms. Using this approach, CTE staff in Phoenix were also able to by-pass barriers to integrating curriculum across multiple vocational areas. Still, the curriculum integration that occurs in the LAMP classroom and in individual vocational classrooms in Phoenix does not involve regular academic teachers. The disconnects that occur when teachers are housed off-site seem more difficult to overcome.

Key Operational Features of the Context

Certain structural features of the context must be in place, or the lack of certain structural features overcome, in order to create the conditions necessary for effective curriculum integration. However, after exploring how specific structural features support or hinder curriculum integration in more depth in Phase II of the study, the team realized that sometimes—even programs with the ideal combination of structural features fail to attain the desired level of integration. The team began to search for other similarities and differences among the seven sites that might explain why a program with a single-industry theme or focus, an on-site location, and only one school partner might struggle with curriculum integration. Upon closer examination, it became clear that programs supporting the most in-depth integration had structural similarities, but also shared common features related to implementation. These included (a) the presence of strong leadership with a commitment to achieving curriculum integration goals, and (b) adequate resources. In most cases, there is some degree of overlap across these areas. For instance, one way strong leaders demonstrate their commitment to curriculum integration is through their willingness to dedicate resources to pay for staff, cover the cost of curriculum development, and provide teachers with targeted training and professional development. The next section describes these key operational features in more depth, and provides examples to support the theory that certain operational features play a significant role in determining whether or not a site can support curriculum integration.

The Presence of Strong Leadership: The Roles That Administrators and Teachers Play

Based on findings from the site visits, it is clear that the presence of leadership at all levels—district, building, and classroom—contributes to developing, implementing, and sustaining successful curriculum integration efforts. In order for curriculum integration efforts to be effective, individuals in leadership roles must be innovative, adaptable, and willing to take risks with instruction, curriculum content, and classroom management. Regardless of the level within the system, leaders need to be good communicators, have a sense of politics, and possess strong organizational skills. Perhaps of even greater importance, leaders at all levels must understand and be committed to the goals of curriculum integration. Curriculum integration is a complex undertaking that cannot be achieved without continuous effort and attention; it is not an automatic byproduct of academies, project-based learning, or other reform strategies. Sites that met the team’s revised definition for curriculum integration demonstrated an explicit intent to integrate vocational and academic curriculum—an intent that leaders communicated to key internal and external audiences, and constantly reinforced.

District-Level Leadership. District-level administrators can play a critical role in helping to establish a clear definition of what curriculum integration means, and underscoring how important it is in relation to other programs and efforts being undertaken by the district and/or school. In cases where the team observed more in-depth curriculum integration, district administrators were willing to provide a vision for curriculum integration, clarify roles and priorities, establish accountability, and trouble-shoot problems that might hinder efforts. Without a certain amount of leadership from district administrators, program developers often find that they do not have the understanding, resources, and staff needed to fully implement curriculum integration activities.

Administrators in the Wake County Public School System understand the concept of curriculum integration and believe it is an important strategy for strengthening classroom learning. Toward that end, all of the district's middle schools have curriculum integration coordinators. High schools are encouraged to use their CTE staffing allocations to create similar positions. The same district administrator has responsibility for both high school academic programs and CTE. The district has sponsored institutes designed to help high school teams develop strategies for aligning career development and school (academic) improvement strategies. As a further demonstration of its support for curriculum integration, the district paid the \$5000 NAF networking fee for Apex High School, and provided funding to send the AOIT teachers to the 2001 NAF conference in California, despite budget constraints and a policy restricting out-of-state travel.

When the UAW–GM CHR first approached the Ingham Intermediate School District (IISD) with the idea for the LAMP initiative, administrators were already exploring how non-traditional methods for teaching and learning might be used to enhance instructional practice throughout the district. Administrators from the IISD were anxious for an opportunity to develop and test curriculum integration strategies, and began promoting the proposed LAMP model to other key stakeholders in the community to generate the necessary approval and support. The district's director of career planning and placement services played an active role on several advisory committees, and was intimately involved in the development and early-implementation phases of the program. Two of the IISD's curriculum developers were assigned to work with 10 IISD teachers and 12 UAW–GM subject-matter experts in a summer-long effort to develop the curriculum for the LAMP classroom. The three LAMP teachers and the project's director are all IISD employees. Through its partnership with CHR, the district was able to create an environment that would support in-depth curriculum integration. Without the district's support, CHR could still have built a solid infrastructure, but they would have struggled with staffing and recruitment. The district's involvement was critical. Because the district was willing to commit staff to lead curriculum development efforts and teachers to deliver the instruction, the program's claim of academic rigor both appeared to be, and was, more legitimate.

After visiting the ESGVROP/TC, observing classes, and interviewing key stakeholders, it became apparent that curriculum integration efforts there are orchestrated largely by the superintendent. Under that lead, teachers and administrators at the ESGVROP/TC are supporting curriculum integration to the extent that they can, given some of the structural barriers the ROP faces as a regional provider of vocational instruction. Over the years, the superintendent has worked with staff to secure a series of competitive federal and state grants to support

implementation and continuation of curriculum integration efforts. In 1994, the ESGVROP/TC sponsored its first Summer Institute for the Integration of Academic and Vocational Learning. The result was a collection of lesson plans for curriculum integration that has been shared with educators across the county. Most recently, the superintendent has encouraged staff to explore Design-Based Learning (DBL) as a strategy for creating interdisciplinary lessons. To help them better understand concepts and theories related to DBL, the superintendent has arranged for teachers to receive training in DBL through courses offered at one of the ESGVROP/TC's two main campuses.

The findings suggest that administrative endorsement of new or ongoing activities, while important, is not, in and of itself, enough. With a heavy emphasis placed on preparing students to meet new academic standards and pass high-stakes tests, many teachers are afraid to deviate too far from traditional lesson plans and instruction, even though they know there are probably more effective ways to engage students in learning. Many need a clear mandate from district administrators that encourages and rewards teachers for innovation, and makes allowances for mistakes, in order to feel comfortable testing strategies for curriculum integration in their classrooms.

Building Level Leadership. Principals who lead curriculum integration efforts understand what it means and how it can be used to strengthen academic and vocational instruction. They are willing to incorporate curriculum integration into the school's overall mission and provide teachers with enough flexibility to test new instructional strategies, understanding that not all efforts will prove successful. They commit to providing teachers with targeted professional development so that they are able to develop and deliver integrated content. This might mean dedicating several professional development days to issues related to curriculum integration, and/or giving teachers the time and funds needed to attend conferences and workshops sponsored by others. In some cases, principals lead schools in altering recruiting techniques to ensure that staff has the qualities and characteristics needed to work with others.

The principal at Johnson County High School is an ardent proponent of curriculum integration. As previously noted, all teachers are given a 90-minute planning period each day. They are encouraged to use this time to interact with one another, coordinating plans and activities. The principal has been attempting to provide both academic teachers and vocational teachers with models and professional development to help them better understand curriculum integration. Staff frequently asks to present on recent curriculum integration activities at faculty meetings. The purpose is two-fold: (a) to recognize participating teachers for their initiative and innovation, and to make other teachers more aware of alternative methods of instruction, with an emphasis on the power of curriculum integration.

While the travel-and-tourism academy at Hilltop High School was already in place when the current principal arrived, he indicated that he strongly supports it. He understands that curriculum integration requires strong content, talented and inspirational teachers, and an administration that can be flexible in working through challenges. Both the principal and the vice principal in charge of the academies work closely with guidance counselors on scheduling and promotion of the school's two academies.

Similarly, the principal at Apex High School supports the AOIT by making it clear to others in the school that it is a priority this leadership is particularly apparent with regard to scheduling and teaching loads. The principal has taken the lead in explaining to non-academy teachers why their classes may need to be bigger and why it is important that academy classes contain only academy students. The principal and assistant principal work together to try to give priority to the scheduling of AOIT students and faculty, including the close proximity of all AOIT classes to help the teachers and students coalesce as an academy.

Each of the seven sites had a project or program coordinator who was responsible for the overall administration and coordination of curriculum integration efforts throughout the initiative's service area. Service areas ranged in size from programs within schools, such as the academy efforts at Apex and Hilltop high schools and the agriculture program at the Johnson County High School, to a single comprehensive high school model like DeBaKey to several schools, as was the case in the Phoenix Union High School District, LAMP, and the ESGVROP/TC. In each of the seven sites visited, the individuals in these roles shared a high level of energy, a can do spirit, and great enthusiasm for their work. They were tuned in to the political environment of the community and sensitive to the differences in language and operating environments of teachers from different disciplines and/or schools.

At the building-level, leadership of curriculum integration efforts sometimes came from the principal's office, but could always be found with the project or program coordinator. Through extensive interviews and observations, it became very apparent that the support that project coordinators provide in the areas of program management and oversight is vital. Over the course of the average day, they find themselves serving not only as troubleshooters and problem solvers, but also as fundraisers, cheerleaders, and peacemakers. The coordinators are the champions of curriculum integration in their schools and districts. In this capacity, they are instrumental in generating interest and support for curriculum integration efforts among all of the different stakeholder groups that need to be involved. They have to be able to sell the concept to school administrators, school boards, teachers, and parents.

Interestingly, project coordinators frequently wear more than one hat. In two of the sites participating in the study DeBaKey and LAMP the same individual serves as both the principal and project coordinator. At the ESGVROP/TC, the superintendent serves as the project coordinator. In Johnson County and at Hilltop High School, the project coordinators are members of the teaching staff. In Phoenix, the project coordinator manages the district's CTE division. In Apex, the AOIT's coordinator is also responsible for coordinating the school's other curriculum integration activities, and serves as the CTE department chairperson.

When the Baylor College of Medicine decided to shift the instructional emphasis at DeBaKey High School from vocational education to college prep, the Houston Intermediate School District hired a new principal to assist with the transition. Initially, changes were met with resistance. For instance, some of the parents and students were unhappy because paid co-op placements became unpaid internships. The size of the vocational staff was reduced by half. To counteract resistance, the new principal established a Community Advisory Committee made up of parents and business people, and chaired by a physician from the Texas Medical Center. Under the principal's leadership, this group worked to generate support for the changes at DeBaKey by

sharing information and conducting outreach to parents and in the community. Over time, the principal's role has evolved, to one of a key change agent, pushing for new programs and challenging the faculty to stretch beyond their academic subject areas.

The LAMP program did not have a project coordinator during its pilot year. Instructors and curriculum developers tried to address problems as they arose. Between the program's 1st and 2nd years, the IISD and CHR hired a LAMP Operations Supervisor to serve as the project's coordinator, act as a building principal for the LAMP program, and serve as a neutral player in facilitating relationships among participating school districts, the UAW, and GM. This role is crucial, and the careful selection of a dynamic individual with a curriculum development background and excellent communication skills made a notable difference in program operations. Because that person is responsible for dealing with the day-to-day administrative details, the project coordinator is able to insulate the teachers from competing agendas and administrative distractions, enabling them to focus on their assigned roles. The LAMP Operations Supervisor also brings a sense of continuity in policy and decision making to the program.

While the CTE supervisor in Phoenix was not responsible for devising the resource teacher strategy, that person was largely responsible for implementing the predecessor's vision. Recognizing almost immediately that buy-in from vocational teachers would be needed as a first step; the CTE supervisor developed a series of workshops to introduce them to new staff, strategies, and expectations. The supervisor understands the importance of hiring the right people to serve as resource teachers, and helps staff make the necessary connections in the schools. The resource teachers also receive support, to overcome barriers to communication and capacity building. For example, in the program's earliest stages, some vocational teachers would request assistance from the resource teachers for days when the vocational teachers would be absent, thinking that the resource teachers could work with their students on writing skills as an alternative to creating lesson plans and hiring a substitute teacher. Clearly, this was contrary to the goal of helping vocational teachers develop the capacity to support curriculum integration in their classrooms as part of general practice. The CTE supervisor addressed this problem by establishing a policy that resource teachers were not to work with classes when the vocational teacher was not also present.

The CTE supervisor observed that over the years, some superintendents have been more supportive of curriculum integration than others. When the political environment is conducive, activities are expanded. When it is not, the program is adapted in a way that will ensure curriculum integration efforts are ultimately sustained. In spite of changing priorities at the district level, efforts in Phoenix have endured largely because of the creativity and perseverance of the CTE supervisor.

The academy director at Hilltop High School was recruited from the teaching staff, and serves as the director for both of the school's academies, in addition to responsibilities as lead teacher for the travel-and-tourism academy. Faced with the challenge of preparing students to meet new state academic standards, the academy director is working with school administrators and academy teachers to recast the curriculum so that the new standards and course requirements are blended into the academy's instruction and sequence of courses. The director has taken the lead

in selling the idea that interdisciplinary lessons, when designed and delivered correctly, reinforce academic learning, and is trying to help staff understand this, as well.

Classroom-Level Leadership. Curriculum integration is not without risks, and teachers must be willing to give up some of the autonomy found in most traditional classrooms in order to work effectively in partnerships with other teachers. They must be both entrepreneurial and flexible. For these reasons, leadership also must come from within the teaching ranks. In some cases, a lead teacher will be elevated to the status of project coordinator, as was the case at Hilltop High School. But, regardless of whether they are formally recognized as leaders, teachers who champion efforts among their peers and demonstrate how curriculum integration can be used to improve student outcomes are essential if curriculum integration is to become an accepted part of ongoing instructional practice.

Curriculum integration activities at Johnson County High School are led by teachers in the agriculture department. Under the leadership of the department chair, all teachers in the agriculture program have developed curricula that use the greenhouse and aquaculture center environment to reinforce complex math, science, and social studies concepts on a regular basis. In most cases, agriculture teachers team with academic instructors in delivering the content. By doing so, the agriculture teachers are, in a sense, training academic teachers on how and when to use integrated curriculum to strengthen lessons in their classrooms. Administrators in Johnson County observed that it helps that the impetus for curriculum integration came from within the school. Because the agriculture and academic teachers work together to develop lesson plans, they are confident that the integrated classroom activities support their respective curricula.

In Phoenix, the continued use of resource teachers was an outgrowth of the leadership and resourcefulness demonstrated by the original English resource teacher. This individual understood how to work with vocational teachers to strengthen students' writing skills through vocational lessons and activities, and the model began to grow. As more English resource teachers were hired, she helped them understand the model. The three English resource teachers currently working for CTE also exhibit leadership characteristics. All three are industrious and outgoing, but, most importantly, they understand the vision. They realize that they have to be flexible, working around vocational teachers' planning time when they need to meet and discuss a classroom activity or develop a lesson plan. They are selective and diplomatic when working with vocational teachers on identifying areas for improvement and making suggestions for change. Under their guidance, vocational teachers are growing more comfortable with the concept of curriculum integration, and some have begun to develop integrated lessons or activities on their own.

At Apex High School, the AOIT's biology teacher seemed to establish a pace and standard for curriculum integration for others on the team. This teacher is clearly comfortable with the concept, and constantly looking for new or expanded opportunities to use curriculum integration. For instance, curriculum integration as an effective method of instruction is purposefully promoted among peers in the biology department. Some of the IT-related lessons used with academy students have been incorporated into the instruction provided in non-academy classes. This teacher acts more like a coach—tailoring instruction to meet the needs of small groups of

students working together to solve problems or complete projects. In this way, alternative classroom management styles are modeled for other teachers.

Across the seven sites, district administrators, building principals, project coordinators, and teachers demonstrated varying degrees of leadership. In some sites, strong leadership was evident at all levels. In others, administrative leadership was weak at the district or building level, but project coordinators and teachers increased their levels of effort, to compensate. In some cases, project coordinators and teachers had to work around a principal who endorsed, but did not necessarily support or fully understand, curriculum integration. In other cases, project coordinators had to work one-on-one with teachers, to help them build the confidence and relationships needed to develop and deliver integrated curriculum. Based on observations, it seems clear that having a strong leader in the project coordinator's position is vital, and weaknesses in this area cannot be overcome by extra efforts on the part of others in the system.

Resources: Financial, Material, Political, and In-Kind

An investment of resources is needed to develop, support, sustain, and expand curriculum integration efforts. While financial resources are necessary to cover the costs of curriculum development, staff, training, and equipment, most of the sites visited for this study also relied heavily on in-kind contributions of materials, facilities, time, guidance from advisory groups, and political support from key stakeholder groups in the community. Of note, all seven sites participating in this study have been successful in generating additional external resources to support curriculum integration efforts.

DeBaKey High School benefits greatly from its relationship with the Baylor College of Medicine (BCM). In addition to serving as the original driver for the effort, BCM helped the Houston Intermediate School District secure a site for the school, and provides continuing support for curriculum development efforts. BCM also supplies a steady stream of speakers, tours, and mentors for both students and teachers. Department directors at the Texas Medical Center strongly encourage their staff to host students in preceptorships. Doctors, nurses, pharmacists, and hospital administrators spend up to 6 hours each week working with DeBaKey students a considerable commitment on the part of Baylor and the medical center's staff. In partnership with the University of Houston, BCM provides 10 full undergraduate scholarships to the university and, 10 full post-graduate scholarships to BCM each year. In addition, the president of the Texas Medical Center has offered to provide the HISD with land for a new building, and is working with district and school administrators to identify sources of funding to help them with the purchase of the new building and equipment.

The UAW–GM Center for Human Resources has made a massive investment in the LAMP program. This includes an enormous financial investment to support curriculum development, staff salaries, and classroom equipment. However, the vast array of in-kind and human resources that UAW and GM have provided over the years is probably even larger. Because the LAMP classroom is housed within a UAW–GM Training Center, students have easy access to different manufacturing facilities and numerous workplace personnel. GM employees are frequently called upon to serve as student mentors, or provide teachers with guidance on the proper context for some of the manufacturing-related components of the curriculum.

In the very earliest stages of curriculum integration activities at Johnson County High School, the superintendent of schools brought a state senator and a state representative through the school to showcase the hydroponics and aquaculture activities. The senator and representative, impressed by the two teachers and the curriculum integration strategies they were employing, began to lobby the state for money to expand the agriculture program at Johnson County High School. Through a combination of government grants and matching funds from the private sector, the school was able to build new, state-of-the-art, high-tech facilities. The new facilities have garnered a lot of positive attention both at the school and in the community. The principal and agriculture teachers were under the impression that academic teachers became more open to the idea of working with the agriculture teachers to develop integrated lesson plans and activities as a result of the excitement surrounding the new greenhouse and aquaculture center.

Apex High School's principal agreed to support the development of the AOIT as long as the school did not have to come up with all of the resources to pay for it. The school district agreed to pay the \$5,000 NAF fee, while an advisory board was created to identify sources of funding from the business community to support the purchasing of equipment and other related activities. This advisory group also meets regularly to review project budgets, critique integrated projects, and provide a real-world perspective for the program, teachers, and students. The AOIT has a parent support group that works with AOIT teachers and students on fundraising activities. During the past school year, the parent support group hosted a raffle and ran a concession stand at a local concert venue to raise funds for academy activities. According to the president of the parent group, working toward fundraising goals builds commitment: "If something is free, it's sometimes not seen as a privilege."

The ESGVROP/TC supports the majority of its workshops and efforts to produce integrated materials through federal and state grants. Almost all of the curriculum integration activities in the Phoenix Union High School District are paid for with Perkins funds. The Hilltop High School's travel-and-tourism academy receives a California Partnership Academy grant, which is used to pay for teacher professional development activities, support curriculum development, and cover lead teachers' salaries. Hilltop High School's principal noted that without this support, the school would not have the resources to support the academy.

Schools need support and must rely on resources—human, financial, material, and often in-kind—from outside the school walls in order to develop and effectively implement curriculum integration efforts. While a few of the sites visited are relying mainly on federal and state grants, most are working to identify and leverage other funding sources in support of their initiatives. In some cases, sites needed to generate new resources to cover the costs of special activities such as field trips or to buy equipment and materials that will enhance curriculum integration. In most cases, school administrators have had to reallocate some of their existing resources to cover the costs of staff and provide them with necessary professional development and common planning time.

It is clear that even after an optimal environment has been identified or created, the extent to which curriculum integration can occur depends largely on specific operational factors. Key operational factors include the presence of strong leadership, particularly at the project level,

with commitment to achieving curriculum integration goals, and sufficient resources—financial, human, material, and in-kind—generally from multiple sources. As was evidenced by the examples included in this section, commitment and leadership are often demonstrated by an investment of resources. The lines between these factors are often blurred. Programs where leadership and resources are abundant provide the best support for curriculum integration.

Conclusion

Based on findings from this study, it is clear that the presence or lack of certain contextual factors related to structure and operations has considerable implications for the shape, scope, and quality of curriculum integration. These findings augment and complement an immense body of research on effective schools, school change, and comprehensive school reform. While not always casting their findings in the language of context, per se, numerous researchers have examined and written about the conditions, environments, and structures in which school improvement strategies are most likely to take root and flourish.

Describing what needs to occur to build professional learning communities within schools, Fullan (2000) examined the structures that block or facilitate the process of “reculturing.” In their seminal work, *Successful School Restructuring*, Newman and Wehlage (1995) identified the need “to organize human, technical, and social resources into an effective enterprise.” Along a similar vein, Schlecty (2001) explored the rules, roles, and relationships that impeded the capacity of schools and teachers to respond to the needs of students. These three examples are but a small sampling of the growing research base that confirms the relationship between successful school reform or school change strategies and the contexts in which they are implemented. The findings from this study suggest that there are actually two kinds of contextual factors—those that affect how curriculum integration efforts are structured, and others that relate to how they are administered.

In addition to documenting the circumstances and structural components that facilitate the effective integration of academic and vocational education at the secondary level, the NIWL team identified a number of lessons for both researchers and practitioners. These include observations related to: the role of the catalyst versus the role of leaders; the need for flexibility; the impacts on teachers and teaching; the importance of careful consideration to fit, when selecting areas to integrate; and the structural support potentially provided by smaller learning communities.

This project began with an exploration of the relationship between the driver, or catalyst, of a particular curriculum integration effort and the scope and quality of that effort. The NIWL team was using the terms *driver* and *catalyst* as proxies for the entity that initiated the curriculum integration initiative in each of the sites. After analyzing the information collected during the first round of site visits, the team concluded that the catalyst’s role in determining the scope and quality of curriculum integration did not extend much beyond its initial influence on the context. While the catalyst facilitated initial efforts to develop curriculum integration, success was ultimately determined by the presence of strong and consistent leadership throughout the design and implementation phases. Sometimes, but not always, leadership rested in the hands of the original driver or catalyst.

Although there are many examples of school reform initiatives led by business and postsecondary institutions, the team found it very difficult to identify solid examples of curriculum integration models in which business and postsecondary educators played leadership roles in design and implementation. Thus, it would appear that leadership for curriculum integration efforts typically comes from within the school system at the classroom, building,

and/or district levels. As noted in an earlier section of this report, leadership at the program or project level is critical. It does not seem to matter who the driver or catalyst is, as long as there is strong leadership at the program implementation level.

Flexibility is a key factor contributing to successful integration. Classroom teachers must become responsible for a curriculum that extends beyond their area of subject matter expertise. Academic teachers must be willing to build vocational content and instruction into their curriculum. Vocational instructors must be willing to integrate academic content into vocational courses and curriculum. Both academic and vocational teachers have to be willing to allow other teachers into their classrooms, and embrace alternative methods of instruction.

Students participating in curriculum integration must also be flexible. In some cases, they may find they have less room in their schedules for other electives. This is especially true when curriculum integration occurs through special programs such as academies with defined course sequences or in pull-out programs like LAMP. In addition, students have to be willing to become active learners. For instance, students in all of the sites participating in this study were working in teams to complete projects that required the application of knowledge and theories from multiple disciplines.

Curriculum integration requires flexibility not only on the part of participating teachers and students, but also by the entire school. As discussed earlier, administrators must be flexible in identifying and reallocating resources to support curriculum integration activities. Teachers not involved in curriculum integration efforts may end up with larger classes, as administrators attempt to accommodate the unique scheduling needs of an academy or a special program. Some schools are trying to provide students participating in curriculum integration through special programs with more choices in course selection through block scheduling, which has ramifications for all stakeholders within the system.

Curriculum integration seems to be a powerful tool for both academic and vocational teachers. Teachers were energized by the prospect of helping their students make connections between theory and application through interdisciplinary lessons that provide a broader perspective on why academic studies are important. Curriculum integration allows and requires teachers to move from a more traditional model, in which they are isolated in the classroom, to a more collaborative one, in which they are required to work in teams to plan, deliver, and/or assess the results of instruction. In some of the sites participating in this study, teachers were working together on one of these tasks; in others, they were working on two; and in a few, they were working together on all three.

Through curriculum integration, academic teachers gain new tools and strategies for teaching their subject. Academic teachers seemed excited about using students' occupational or vocational interests to teach academic theories and lessons. Vocational teachers seemed to view curriculum integration as a means for enhancing the educational experience in a way that would benefit the whole child. By working with academic faculty to strengthen academic learning in vocational classes, vocational teachers believed they were better able to prepare their students for the complex problems adults face in the workplace and in their personal lives. In a number of sites, researchers were told that academic teachers gained a new respect for the academic rigor of

vocational curricula and their vocational counterparts. In most cases, teachers believed that curriculum integration made them more effective and, in at least two cases, more efficient, as well.

Curriculum integration requires thoughtful consideration to fit when selecting which academic and vocational subjects to integrate. In some cases, the integration of two subject areas does not make sense. Even when it does make sense, and the curricula for multiple subject areas have been integrated, it is not realistic to expect that every lesson will involve integration. Sometimes teachers will need to cover lessons that are critical to understanding rules or theories related to a specific subject area or discipline in isolation from the larger integrated curriculum. It is important to recognize these instances, and not try to force-fit the lessons into others solely for the purposes of curriculum integration. Integration should add value to instruction. Students should gain a better understanding of the related academic and vocational subject matter than they would through the delivery of either on its own.

The findings also suggest that smaller learning communities may provide a particularly conducive environment for curriculum integration. Through the use of smaller learning communities, it is possible to place groups of students with common occupational or vocational interests with the same core group of teachers. Because all students in a class have similar vocational interests, academic teachers can use industry examples and vocabulary to illustrate theories or test students' comprehension. Students share a common core of teachers, making communication and coordination of interdisciplinary projects and activities easier. Still, while a smaller learning community may have the ideal combination of structural features for supporting curriculum integration, researchers learned that it will not occur without the necessary levels of leadership, commitment, and resources.

Perhaps most important of all, the study helped to debunk some of the more pervasive myths that surround curriculum integration, and began to build an evidentiary base for expanded use of curriculum integration as a strategy for enhancing student achievement. While quantifiable outcome data were scarce, sites such as DeBakey and the Apex AOIT employed curriculum integration strategies in heterogeneous and honors classes with high-achieving, university-bound students. The team found numerous powerful examples of ways in which curriculum integration was used to augment and reinforce academic instruction, and found no evidence that curriculum integration watered down academic classes or detracted attention from academic standards. To the contrary, several sites were experimenting with innovative ways to use curriculum integration to help students prepare for high-stakes testing.

In expanding its data collection and analysis beyond the four models that constituted the original focus of this study, NIWL created a more explicit definition of curriculum integration, and identified areas for further study. Clearly, additional research is needed to look at outcomes within the context of this new, very rigorous definition. While a focal point of this research should be measuring or determining the extent to which curriculum integration contributes to academic performance, it may be necessary to begin with an effort to determine the extent to which secondary institutions are using the more rigorous definition of curriculum integration.

In the future, researchers might want to conduct a large-scale survey of schools, asking administrators to rate their school's curriculum integration efforts against each of the key elements of the definition, and then against the definition as a whole. By using the definition to determine the extent to which curriculum integration is occurring, such a survey could help to identify potential sites for further research, including projects that could feature experimental or quasi-experimental designs.

There is also a need for a concurrent technical assistance effort to promote a heightened understanding among practitioners of what curriculum integration is. In trying to identify sites for this study, the NIWL team came across many instances in which academic and vocational teachers were working together to integrate curricula through isolated short-term projects. Also plentiful were examples of vocational teachers introducing academic content into their courses without the input or collaboration of academic teachers and, to a lesser extent, examples of academic teachers attempting integration without vocational partners. While such efforts can be important stepping stones to more sophisticated curriculum integration efforts, they are not sufficient, in and of themselves, to meet the more rigorous definition of curriculum integration developed through this study.

Once practitioners understand what curriculum integration is, targeted technical assistance, informed by findings from this study, can help them move toward richer and more complex approaches to curriculum integration. Such assistance should help them think through the context in which they operate, and how curriculum integration can best be implemented and sustained over longer periods of time. The revised definition can serve as both a guide and a goal.

In the future, researchers might also want to examine how the integration of academic, and career and technical, subject matter aligns with other high school reform models. Another study might explore how federal Perkins funds are used to support curriculum integration, and what state and local resources are brought to bear.

Curriculum integration initiatives that represent a series of conscious and informed strategies used to connect academic and vocational content so that one becomes a platform for instruction in the other over an extended period of time can be a powerful education reform strategy. The restructuring of the content of the curriculum and instruction seems to have a positive impact on academic and vocational teachers individually, and as on teams. At the same time, students participating in curriculum integration initiatives appear more motivated to learn and attain both academic and vocational knowledge, understanding, and skills. Further research, coupled with technical assistance, can expand what is known about this powerful strategy, and enhance practitioners' capacity to use it effectively

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Appendix

INTERVIEW GUIDE

Name?

Organization?

I. Goals/Purpose

- Describe the nature of the [curriculum integration] project.
- What is the purpose of the project?
- Why did your organization/institution/school decide to develop the project?

II. Community Setting/History

a. Community Setting

- Describe the political, economic, and social climate of community
- Resources, facilities for project
- Number of school sites involved in curriculum integration efforts?

b. History

- How did the project start? What was the lead organization or entity?
- When did the project start? Planning? Implementation?
 - How was the project designed? Who was involved?
 - How did the context or environment (e.g., focus, location, # of sites, policy environment, resources) in which you work affect or shape program design for curriculum integration efforts?
 - How was the project implemented? Who was involved?
 - How has the project evolved/progressed over time (e.g., with regard to structure, student participation, stakeholder participation, etc.)?

III. Project Design

a. Components

- What are the key components of the [curriculum integration] project? What academic and career/tech-ed courses are integrated? How are they integrated?
- How does vocational instruction support academic learning?
- How does academic instruction support vocational learning?
- What is the content of the integrated curriculum? In what ways has the program's design influenced the content of the integrated curriculum?
- How is integrated curriculum delivered? In what ways has the program's design influenced the modes of instruction used in delivering the integrated curriculum?
- How does the content affect instruction/delivery? How do instruction/delivery methods affect the content?

- How are you involved in day-to-day program operations? What's your role? (e.g., internships, articulation agreements, classroom instruction, curriculum design, etc.)

b. Student Participation

- Who participates?
 - How many students participate?
 - Demographics of participants? Male? Female? Race?
 - Grade level? Average GPA?
- How are participants identified/selected? Are they required to meet entrance requirements or course prerequisites?
- What are the educational *expectations* of participating students? Why do you think students participate? What do they expect to gain personally? Academically? What are their career/education goals? College? Training? How does the program help them achieve these goals?
- What are the educational *experiences* of participating students? What does their average day look like?
- Are students required to reach certain benchmarks in order to remain in the program? What are they?

c. Standards and Assessment

- On what standards (e.g., state, local, industry-specific) is the project based?
- How is the project connected to high academic standards and other school reform efforts?
- How is student achievement assessed and documented? Portfolios? Skill certificates? College credit? Are these procedures the same as those used for other students? If not, how do they differ?

d. Staff

- How are project staff selected/recruited for participation in the project?
- How are secondary educators prepared to deliver integrated curricula? Who decides what kinds of preparation to provide them with? Who provides it? School? A source outside the school?
- How does the professional development offered to project staff differ from that provided to other educators in the school or district?
- Are participating educators offered internships with employers? If yes, please describe the nature and duration of these internships?
- Are additional professional development opportunities needed to improve the project? If yes, what kinds?
- Does the project include common planning time for academic and vocational educators? If yes, please describe what takes place during that time. If no, please describe the other strategies that are used to integrate curriculum/other ways educators are supported in these efforts.
- How do participating staff/administrators perceive the integrated curriculum? Pros? Cons? How do other staff/administrators perceive it?

e. Stakeholder Roles

- ❑ What are your organization/institution/school's roles and responsibilities? Who from your organization participates in the project? How were they selected?
- ❑ What are the key responsibilities of other stakeholder groups? How do the different stakeholders interact with one another?
- ❑ What roles do parents play? How are they informed about the purpose and strategies of the curriculum integration project?

f. Resources

- ❑ How is the project funded? What is the approximate operating budget?
- ❑ What resources does your organization/institution/school contribute?
- ❑ What additional resources were needed to develop and launch the project? How were they obtained? From whom?
- ❑ What additional resources are required to operate the project on a day-to-day basis? How are they obtained? From whom?
- ❑ What kinds of in-kind contributions does the project receive? From whom?
- ❑ Who makes decisions with respect to resource allocation? How are decisions made?

IV. Outcomes

- ❑ Does the project have an evaluation component? If yes, please describe it.
- ❑ How do you determine whether or not you are making progress toward project goals?
- ❑ What evidence do you have that the [curriculum integration] project contributes to student learning? What student outcomes do you document? How do you know you are having a positive impact on participating students? How do you collect and use this information?
- ❑ Is participation in the project helping students connect to future education and career plans? How can you tell? What percentage of students go on to postsecondary education?
- ❑ How does the project affect outcomes for low performing students? How do you know?
- ❑ What are the impacts of participation on your organization/institution/school? How has the program benefited your organization/institution/school?
- ❑ What data do you need to support the project's continuation? Is continued funding for the project contingent upon certain outcomes? If yes, what are they?

V. Lessons Learned

- ❑ What are the strengths and limitations of the project?
- ❑ How does the context/environment (e.g., theme, location, # of sites involved, policy environment, resources) support or hinder curriculum integration efforts?
- ❑ If you had to do it all over again, what would you do the same? Differently?
- ❑ What have been the toughest challenges or barriers in implementing the project? What strategies were used to overcome them?
- ❑ What guidance would you offer to others who are attempting to implement integrated curriculum?
- ❑ What are your next steps? Short-term? Long-term?
- ❑ How will you sustain these efforts?

Footnotes

ⁱ The National Research Center for Career and Technical Education (NRCCTE) serves as a primary source for information on career and technical education. With a grant from the U.S. Department of Education's Office of Vocational and Adult Education, NRCCTE seeks to provide practitioners at the local, state, and national levels with innovative strategies and field-tested approaches for improving the practice of career and technical education that will ultimately produce positive impacts on student achievement. NRCCTE is housed out of the University of Minnesota. Other university partners include the University of Illinois, The Ohio State University, Oregon State University, and The Pennsylvania State University. The AED National Institute for Work and Learning (NIWL) and the Center for the Social Organization of Schools at Johns Hopkins University contribute to the work of the NRCCTE as Associate Partners.

ⁱⁱ If a critical mass of students from one high school enrolls in the same vocational class, a separate class might be offered on that high school's campus.

ⁱⁱⁱ SCANS: Secretary's Commission on Achieving Necessary Skills at the U.S. Department of Labor identified a three-part foundation of skills and personal qualities needed for solid job performance. These skills, organized under the categories basic skills, thinking skills, and personal qualities, are known as SCANS skills.

^{iv} The California School Leadership Academy is an instructional leadership organization with 12 Regional Centers around the state of California.

^v DECA is a national association for marketing students.

^{vi} FBLA stands for Future Business Leaders of America.

^{vii} a career-education program associated with the Boy Scouts of America.

^{viii} FFA Future Farmers of America an organization for students studying agriculture.