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ABSTRACT

This Ideabook is designed to help vocational/tech prep and applied academics teachers plan and present their subject matter in a more integrated way. Section 1 discusses integrating the curriculum, rationale for using the curriculum, and how the book helps teachers modify their instructional programs to more closely match demands and realities of the real world. Secretary's Commission on Achieving Necessary Skills (SCANS) competencies and SCANS foundation skills and qualities are listed. Section 2 looks at the three levels of integration: infusion; linked; and multidisciplinary. Section 3 presents strategies and activities a teacher can use to make academic instruction more integrated, divided into these areas: teach thinking strategies; use authentic assessment tools; use rubrics and periodicals; simulate the workplace; incorporate projects; use demonstrations and discovery; use planning tools that support integration; and devise joint plans with other teachers. Section 4, focusing on the information superhighway, covers the Internet, World Wide Web, e-mail, newsgroups, mailing lists, and Web sites. Section 5 describes curricular resources for applied communications, mathematics, and science; applied communications; applied mathematics and science; applied mathematics; and applied science. Contact information is also provided. Section 6 contains excerpts from the Occupational Competency Analysis Profile for business administration and management. (YLB)

Making Connections:

A Curriculum Ideabook for Teachers of Applied Academics and Business & Management

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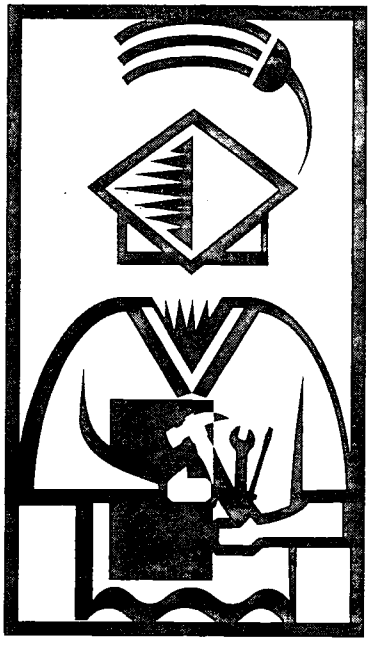


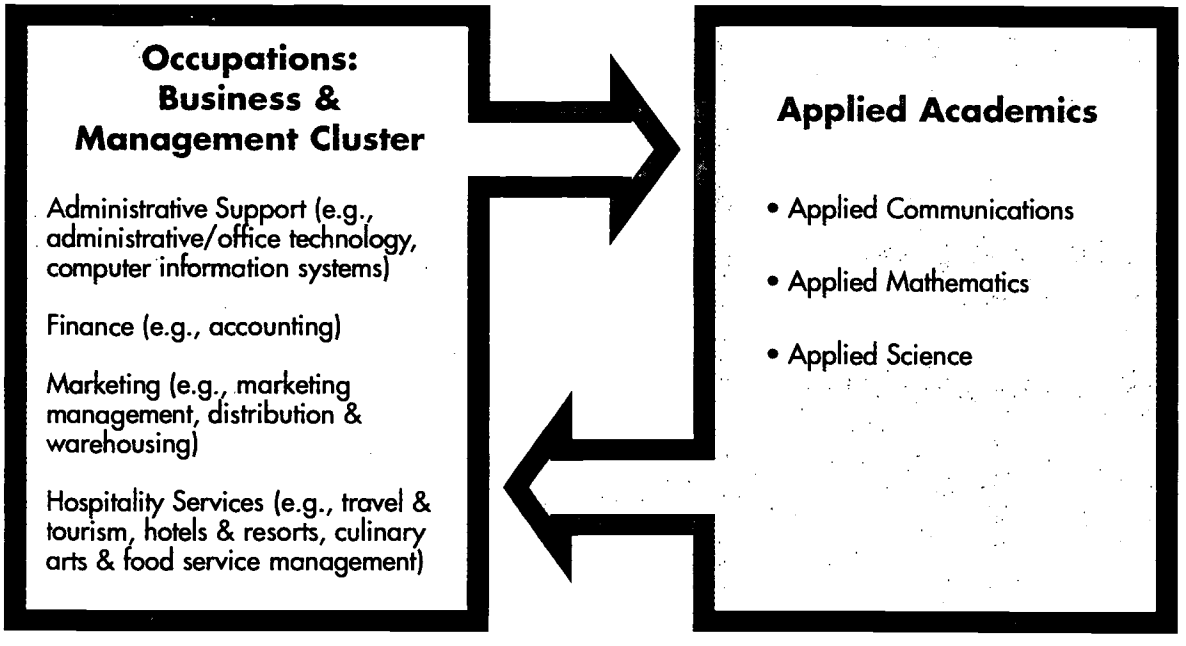
Making Connections: A Curriculum Ideabook for Teachers of Applied Academics and Business & Management

The Ohio State University
Vocational Instructional Materials Laboratory
1900 Kenny Road
Columbus, Ohio 43210-1090

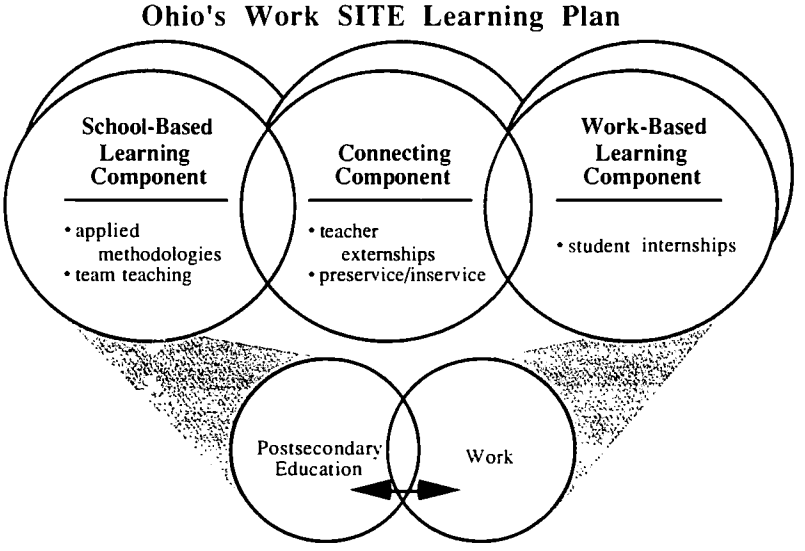
1999

"When you reach for the stars, you may not quite get one,
but you won't come up with a handful of mud either."

Leo Burnett, quoted in Communications Briefings, August 1995



Work SITE Learning Model



The first Ideabook was produced in 1998 as part of the national demonstration project described below. Its intended audience was vocational and academic teachers serving students in the Industrial & Engineering Systems Career Cluster. As part of a new five-year School-to-Work Urban/Rural Opportunities Grant awarded by the U.S. Department of Labor to the Buckeye Hills Collaborative Partnership, Ideabooks are being developed for Ohio's five other career clusters: Business & Management (1999), Health Services (2000), Human Resources/Services (2001), Environmental & Agricultural Systems (2002), and Arts & Communication (2003).

Project Overview

Ohio's Work SITE Learning Model is the product of a national demonstration project for the integration of academic and vocational learning, funded by the U.S. Department of Education. The model comprises three components. Help in replicating each of these components is provided through three implementation guides developed as part of this project:

- **Connecting Component:** To help ensure that teachers are prepared to serve as a link between the workplace and the school setting, teams of academic and vocational teachers should participate in short-term worksite externships focusing on the use of academics on the job. Those wishing to create teacher externship experiences can get assistance from *Helping Teachers Connect Academics to the Workplace: An Implementation Guide for Teacher Worksite Externships.*

These guides are available from the Vocational Instructional Materials Laboratory (VIML) at The Ohio State University. The sales office is located at 1900 Kenny Road, Columbus, Ohio 43210; Phone (614) 292-4277 or (800) 848-4815, ext. 2-4277 Fax (614) 292-1260 www.cete.org/products

Other Support Resources

Worksite Mentoring Guidebook; Practical Help for Planning and Implementing QUALITY Worksite Learning Experiences

For training assistance, contact Dot Keil, 614-292-9089; or 800-848-4815, ext. 2-9089.

- **School-Based Learning Component:** Following the externship experiences, teams have a more-solid basis for developing activities for the classroom and laboratory that require the use of academics within an authentic workplace context. Vocational teachers can also collaborate with academic teachers in incorporating into applied academic classrooms the concrete, hands-on methodologies that have proved so successful with the vocational student population. Help in developing applied academic activities can also be found in *Making Connections: A Curriculum Ideabook for Teachers of Applied Academics and Industrial & Engineering Systems.*

- **Work-Based Learning Component:** To reinforce for students the fact that academic skills are critical to success in the workplace—and are highly valued by employers—students, too, need to spend time in the workplace, focusing on the use of academics on the job. Early in the first year of a vocational program, teachers should arrange for student worksite learning experiences (SWLEs) through which students observe how academics are used in local business and industry, health care, government, or social service agencies. *Helping Students Connect Academics to the Workplace: An Implementation Guide for Student Worksite Learning Experiences* is designed to help schools develop SWLE programs.

The following improvements may result from these efforts to connect school and work:

- Teaching team members often become more united, enhancing their abilities to jointly assess how academics are applied to a given occupation.

- Teaching team members are more likely to collaborate in planning, preparing, and delivering academics that are integrated with occupationally specific education.

- Teaching team members are better prepared to structure meaningful student worksite learning experiences for their students.

- Students who have participated in SWLEs are more likely to understand the connection between academic and vocational studies—because they have seen it in practice in the workplace.

ACKNOWLEDGMENTS

This Ideabook is the product of many people who committed their time and talents to helping make it a useful resource for educators wishing to integrate academic and vocational/tech prep curricula.

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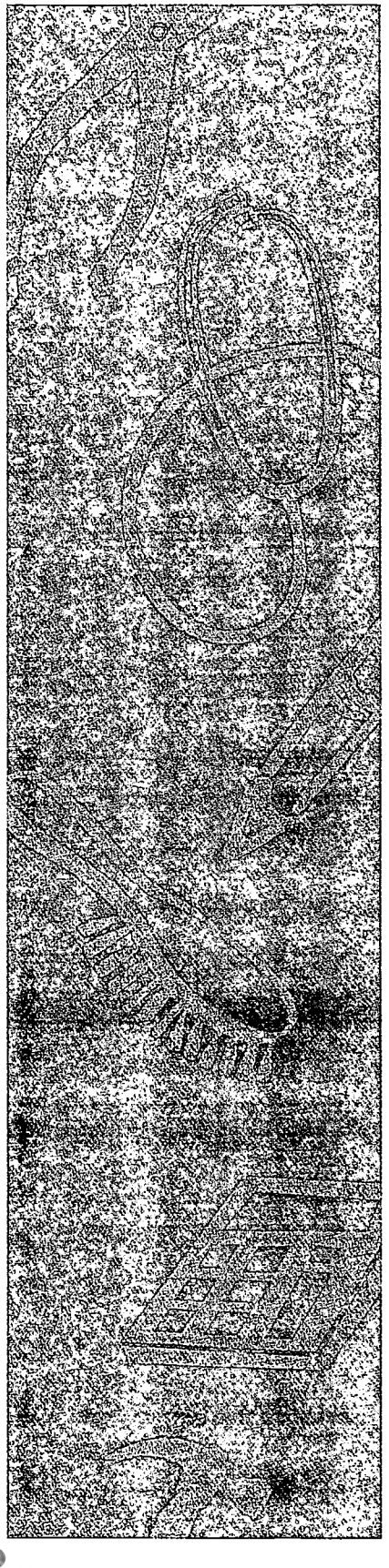

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The Ideabook: An Introduction

This Ideabook was developed to help both vocational/tech prep and applied academics teachers plan and present their subject matter in a more integrated way. Let's start with a look at why such a book is needed.

A Curriculum Divided

The American educational system has long divided learning into its separate parts in order to simplify the teaching process. Thus, students learn English from English teachers, mathematics from mathematics teachers, science from science teachers, and vocational subjects from vocational teachers. There are in fact students who thrive in this environment, who relish the learning of abstract concepts taught in isolation. But there are many, both in vocational/tech prep and college prep programs, who do not.

> *Scenario: Marvetta is an underachiever. She can be relied upon to do her English homework assignments on time, but the work is clearly done at the last minute, with a minimum amount of effort expended. Yet Marvetta spends long hours working on the school newspaper. Why can't she bring that devotion and concentration to bear on her English assignments?*

Marvetta is not alone. For some students, classwork is busywork—something done for the teacher, with no relevance to the real world. They don't take it seriously. Yet when the work is real—publication of a school newspaper—their motivation and effort increase dramatically.

For some students, classwork is busywork with no relevance to the real world.

It's not just a motivational issue. Some students—again, both vocational/tech prep and college prep—do not understand concepts taught purely on a theoretical level. Until they see the concept in its application, they do not grasp it. They may memorize it for a test, but it slips and slides out of their mental database as soon as the test is over. The student studying accounting may react this way to information about subjective and objective cases of pronouns in English class. The student hoping to major in English in college may react this way to information about sine, cosine, and tangent in advanced mathematics class.

Some students do not understand concepts taught purely on a theoretical level.

If you have ever taken a foreign language, you have probably said at some point, "Well yes, I took French (or Spanish or German or whatever) for x number of years, but I don't remember much. I never had to use it, you know." We acknowledge this, yet we don't apply this knowledge in our own classes. After all, we're teaching a subject we love, and surely the students will share that love if only we can convey it with the proper skill and enthusiasm.

Scenario: The English teacher is covering a simple grammatical concept. Once the concept has been taught, he tests the students. The majority fail the test. So the English teacher regroups and teaches the concept using a different approach. When he next tests the students, many more pass the test. But this is a new English teacher, and he is determined that ***all*** *students should pass. So he keeps trying. Finally all students pass a test on the concept. The English teacher is thrilled ... until he discovers that few of the students apply the concept correctly in their writing or speaking. They only apply it on tests covering the concept in isolation.*

This is another flaw in a system in which knowledge is broken down into separate parts. If students treat grammar lessons as separate—and unrelated to speaking and writing—in English classes, imagine what happens to that knowledge when they walk across the hall to mathematics or science or history class. Clearly, in their minds, grammar is not relevant to those classes.

Integrating the Curriculum

How do you solve the problem of the fragmented curriculum? Since there is no sign that classes will cease to be divided in this way in most schools in the near future—or ever—what can be done?

If you are an applied academics teacher—

- First, ensure that concepts are taught in an applied, hands-on fashion.
- Second, ensure that classroom activities reflect the real world. Require students to draw on what they have learned in many different classes in order to solve complex problems.

If you are a vocational teacher—

- Foster respect for—and systematically reinforce—the academic skills students will need to succeed in the world of work.

Why Should You Use This Approach?

When the emphasis in the classroom is on hands-on application and solving of real-world problems, the instructional methodology switches from one that is teacher-centered (lectures, demonstrations) to one in which students are highly active and involved—a prerequisite to learning. When you have the sole responsibility for action in the classroom, ***your*** teaching may or may not result in ***student*** learning. But when students share actively in the action, they are bound to discover and grow and learn.

When students share actively in the action, they are bound to discover and grow and learn.

An approach that increases student learning and retention is ***critical*** given today's world of work. (And most students—not just those in vocational education—will end up in that world sooner or later.)

What does the work world demand these days?

- The world of work demands teamwork—yet we primarily require individual effort in the classroom.
- It demands problem-solving and thinking skills—yet we primarily focus on mastery of individual concepts as measured on objective tests (true-false, completion, multiple-choice, matching).
- It demands lifelong learning skills, since information and technology now change so rapidly—yet we plan our courses as if we had to teach students everything they need to know for a lifetime.

The competencies and foundation skills and qualities required for the work world were identified and defined by the Secretary's Commission on Achieving Necessary Skills (SCANS) in 1991. These are presented at the end of this section, pp. 8–14.

SCANS/2000
The Workforce Skills Website
<http://infinia.wpmc.jhu.edu>

How This Ideabook Can Help You

This Ideabook is designed to help you modify your instructional program to more closely match the demands and realities of the real world. Its core content was developed as part of an earlier project on academic-vocational integration that began with an extensive survey of what teachers in Ohio are doing to integrate academic and vocational instruction. It began, in short, with a detailed picture of ***reality***:

- We know, for example, that you may be a new teacher with a major in mathematics who thought you'd be teaching college prep mathematics and found yourself instead teaching something called ***applied mathematics*** to auto mechanics students—this despite the fact that you may not even know where to add the oil in your own car. Worse, you're in a totally separate building from the auto mechanics teachers and rarely, if ever, have the opportunity to talk with them, let alone plan jointly. Furthermore, the other mathematics teachers in your department make it very clear that they feel your applied mathematics courses are not "real math."
- Or, you may be an ***applied science*** teacher who worked very hard for two years with your vocational counterpart to develop activities relevant to your students, who were all in health occupations programs. You have just gotten your assignment for next year and have discovered that the students in your applied classes will all be students in electricity and electronics programs.
- Or, you may be an ***applied communications*** teacher who is being told by the vocational department that you must focus strictly on the communications competencies needed for the occupational area. Yet your English department chair says that you must focus strictly on the English competencies identified by the State as essential for that grade level. So, do you teach Shakespeare or the skills needed to read job specs?

- Or, you may be a ***vocational*** or ***tech prep*** teacher who has always done a good job teaching occupational skills and the academic and employability skills related to them. You've always been happy working within your department and don't see any reason to get involved with those academics who, in your opinion, don't understand the occupation or the real world of work at all.

The situations around the state vary greatly. For every worst-case scenario, there is its opposite. There are supportive administrators, vocational and academic teachers working in tandem, and schedules and facilities supporting integration. The point is this: Regardless of your situation, there is a step you can take to move further along the road to integration.

Regardless of your situation, there is a step you can take to move further along the road to integration.

The ideal is ***fully integrated academic and vocational instruction***—for one very good reason: it provides students with a better education and prepares them more effectively to enter and succeed in the world of work:

- When teachers work as teams, they are modeling teamwork.
- When teaching teams—made up of teachers with different specialties—pool their strengths to reach their goals, that reflects the reality of the world of work.
- When students are required to apply all the skills they learn—in an orchestrated manner—in order to solve real problems, they are learning how to function in the workplace of today and tomorrow.

However, if the ideal and your own situation seem worlds apart, you need not throw your hands up in despair. The old cliché holds true: Rome was not built in a day. You can improve your situation, one step at a time:

- Look at the ideas in this book.
- Immediately try those that are within your power.
- For the rest, think about what you'd like your "classroom" to look like, in terms of integration, in five years.
- Determine the steps you will take and the support you will need to get there.
- Then get started—step by step.

What Work Requires of Schools: A SCANS Report for America 2000 (Washington, DC: Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, June 1991), pp. B-1, B-2, C-2, C-3.

SCANS Competencies

Resources

Allocates Time

- Selects relevant, goal-related activities.
- Ranks activities in order of importance.
- Allocates time to activities.
- Understands, prepares, and follows schedules.

Allocates Money

- Uses or prepares budgets, including making cost and revenue forecasts.
- Keeps detailed records to track budget performance.
- Makes appropriate adjustments.

Allocates Material and Facility Resources

- Acquires, stores, and distributes materials, supplies, parts, equipment, space, or final products in order to make the best use of them.

Allocates Human Resources

- Assesses knowledge and skills and distributes work accordingly.
- Evaluates performance, and provides feedback.

Interpersonal

Participates as a Member of a Team

- Works cooperatively with others and contributes to the group with ideas, suggestions, and effort.

Teaches Others

- Helps others learn.

Serves Clients/Customers

- Works and communicates with clients and customers to satisfy their expectations.

Exercises Leadership

- Communicates thoughts, feelings, and ideas to justify a position.
- Encourages, persuades, convinces, or otherwise motivates an individual or groups, including **responsibly** challenging existing procedures, policies, or authority.

Negotiates

- Works toward an agreement that may involve exchanging specific resources or resolving divergent interests.

Works with Cultural Diversity

- Works well with men and women and with a variety of ethnic, social, or educational backgrounds.

Information

Acquires and Evaluates Information

- Identifies the need for data.
- Obtains data from existing sources or creates needed data.
- Evaluates the relevance and accuracy of the data.

Organizes and Maintains Information

- Organizes, processes, and maintains written or computerized records and other forms of information in a systematic fashion.

Interprets and Communicates Information

- Selects and analyzes information.
- Communicates the results to others using oral, written, graphic, pictorial, or multimedia methods.

Uses Computers to Process Information

- Employs computers to acquire, organize, analyze, and communicate information.

Systems

Understands Systems

- Knows how social, organizational, and technological systems work and operates effectively within them.

Monitors and Corrects Performance

- Distinguishes trends.
- Predicts impact of actions on system operations.
- Diagnoses deviations in the function of a system/ organization.
- Takes necessary action to correct performance.

Improves and Designs Systems

- Makes suggestions to modify existing systems to improve products or services.
- Develops new or alternative systems.

Technology

Selects Technology

- Judges which set of procedures, tools, or machines, including computers and their programs, will produce the desired results.

Applies Technology to Task

- Understands the overall intent and the proper procedures for setting up and operating machines, including computers and their programming systems.

Maintains and Troubleshoots Technology

- Prevents, identifies, or solves problems in machines, computers, and other technologies.

SCANS Foundation Skills and Qualities

Basic Skills

Reading

- Locates, understands, and interprets written information in prose and documents—including manuals, graphs, and schedules—to perform tasks.
- Learns from text by determining the main idea or essential message.
- Identifies relevant details, facts, and specifications.
- Infers or locates the meaning of unknown or technical vocabulary.
- Judges the accuracy, appropriateness, style, and plausibility of reports, proposals, or theories of other writers.

Writing

- Communicates thoughts, ideas, information, and messages in writing.
- Records information completely and accurately.
- Composes and creates documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts.
- Uses language, style, organization, and format appropriate to the subject matter, purpose, and audience.
- Includes supporting documentation and attends to level of detail.
- Checks, edits, and revises for correct information, appropriate emphasis, form, grammar, spelling, and punctuation.

Arithmetic

- Performs basic computations.
- Uses basic numerical concepts such as whole numbers and percentages in practical situations.
- Makes reasonable estimates of arithmetic results without a calculator.
- Uses tables, graphs, diagrams, and charts to obtain or convey quantitative information.

Mathematics

- Approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- Uses quantitative data to construct logical explanations for real-world situations.
- Expresses mathematical ideas and concepts orally and in writing.
- Understands the role of chance in the occurrence and prediction of events.

Listening

- Receives, attends to, interprets, and responds to verbal messages and other cues such as body language in ways that are appropriate to the purpose; for example, to comprehend, to learn, to critically evaluate, to appreciate, or to support the speaker.

Speaking

- Organizes ideas and communicates oral messages appropriate to listeners and situations.
- Participates in conversation, discussion, and group presentations.
- Selects an appropriate medium for conveying a message.
- Uses verbal language and other cues such as body language appropriate in style, tone, and level of complexity to the audience and the occasion.
- Speaks clearly and communicates a message.
- Understands and responds to listener feedback.
- Asks questions when needed.

Thinking Skills

Creative Thinking

- Uses imagination freely.
- Combines ideas or information in new ways.
- Makes connections between seemingly unrelated ideas.
- Reshapes goals in ways that reveal new possibilities.

Decision Making

- Specifies goals and constraints.
- Generates alternatives.
- Considers risks.
- Evaluates alternatives.
- Chooses best alternatives.

Problem Solving

- Recognizes that a problem exists (i.e., there is a discrepancy between what is and what should or could be).
- Identifies possible reasons for the discrepancy.
- Devises and implements a plan of action to resolve discrepancy.
- Evaluates and monitors progress.
- Revises plans as indicated by findings.

Seeing Things in the Mind's Eye

- Organizes and processes symbols, pictures, graphs, objects, or other information.
- For example, sees a building from a blueprint, a system's operation from schematics, the flow of work activities from narrative descriptions, or the taste of food from reading a recipe.

Knowing How to Learn

- Recognizes and can use learning techniques to apply and adapt new knowledge and skills in both familiar and changing situations.
- For example, is aware of learning tools such as personal learning styles (visual, aural, etc.); formal learning strategies (notetaking or clustering items that share some characteristics); and informal learning strategies (awareness of unidentified false assumptions that may lead to faulty conclusions).

Reasoning

- Discovers a rule or principle underlying the relationships between two or more objects and applies it in solving a problem.

- For example, uses logic to draw conclusions from available information, extracts rules or principles from a set of objects or written text, applies rules and principles to a new situation, or determines which conclusions are correct when given a set of facts and a set of conclusions.

Personal Qualities

Responsibility

- Exerts a high level of effort and perseverance toward goal attainment.
- Works hard to become excellent at doing tasks by setting high standards, paying attention to details, working well, and displaying a high level of concentration even when assigned an unpleasant task.
- Displays high standards of attendance, punctuality, enthusiasm, vitality, and optimism in approaching and completing tasks.

Self-Esteem

- Believes in own self-worth and maintains a positive view of self.
- Demonstrates knowledge of own skills and abilities.
- Is aware of impact on others.
- Knows own emotional capacity and needs and how to address them.

Sociability

- Demonstrates understanding, friendliness, adaptability, empathy, and politeness in new and ongoing group settings.
- Asserts self in familiar and unfamiliar social situations.
- Relates well to others; responds appropriately as the situation requires.
- Takes an interest in what others say and do.

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About Vocational-Academic Integration

Words have an amazing power to distract. If you were to read a great many books and articles about the blending of academic and vocational subjects these days, you would see many different terms—*applied academics* and *vocational-academic integration* and *interdisciplinary instruction* and *correlated instruction*—and many different definitions of those terms. It's easy to get caught up in debating terms and to divert your attention from what is most important: improving instruction for students.

The Integration Continuum

For the purposes of this document, let's consider a model that is a continuum. The continuum does ***not*** differentiate between good and bad instruction. Rather, it differentiates, in degrees, between good traditional instruction that serves some students well ***and*** increasingly more integrated instruction that serves most students more effectively.

The integration continuum differentiates, in degrees, between good traditional instruction that serves some students well and increasingly more integrated instruction that serves most students more effectively.

- In the stereotypical ***traditional model***, we find each individual teacher working alone in the classroom, teaching only his or her assigned subject in isolation. If the teacher is enthusiastic, knowledgeable, and creative, some students will thrive in this environment.
- At the ***lowest level of the integrated model***, we find those same individual teachers working alone but trying very hard to relate the subject matter to the real world of life and work. They also try to incorporate hands-on activities requiring students to apply what they have learned.
- The ***next level*** moves those teachers out of isolation into varying levels of cooperation and collaboration:
  - ✓ Planning occasional joint activities
  - ✓ Utilizing team teaching
  - ✓ Aligning curricula
- The ***top level*** involves total interdisciplinary teaming in which teachers and instruction are no longer isolated. Instead, they all are focusing their efforts on a major project or theme.

In recent years, researchers have been looking at various models of integration. Two notable efforts have been spearheaded by the National Center for Research in Vocational Education (NCRVE) at Berkeley and the Southern Regional Education Board (SREB). The publications from both NCRVE and SREB (see reference list at the end of this section) are full of exciting examples of what happens in schools that adopt—and truly support—an integrated model.

NCRVE Models

Most of the NCRVE publications on integration focus on eight models:

1. Vocational Teachers Introduce Academic Competencies into Vocational Courses
2. Vocational and Academic Teachers Collaborate to Enhance Academic Competencies in Vocational Classes
3. Academic Teachers Enhance the Vocational Relevance of the Academic Curriculum
4. Curriculum in Both Vocational and Academic Courses Is Modified and Aligned
5. Senior Projects (seniors replace electives with a project)
6. The Academy Model (school-within-a-school)
7. Occupational High Schools and Magnet Schools (in which all teachers—academic and vocational—are assigned to the same facility to facilitate collaboration and course alignment)
8. Occupational Clusters, Career Paths, and Occupational Majors (in which all teachers—vocational and academic—belong to occupational clusters rather than, or in addition to, conventional departments)

SREB Model

The SREB model is in the form of case studies of successful practices derived from a program called *High Schools That Work*. This program was established by the SREB-State Vocational Education Consortium, a partnership of states, school systems, and school sites (850 sites in 22 states at the time of this writing). According to the High Schools That Work Homepage on the Internet, the program is based on the belief that students in general and vocational programs of study can master complex academic and technical concepts if schools create an environment that encourages students to make the effort to succeed.

High Schools That Work Website
<http://www.sreb.org/Programs/hstw/high.html>

The High Schools That Work program has two major goals:

- To increase the mathematics, science, communication, problem-solving, and technical achievement and the application of learning for career-bound students to the national average of all students.
- To blend the essential content of traditional college preparatory studies—mathematics, science, and language arts—with quality vocational and technical studies by creating conditions that support school leaders, teachers, and counselors in carrying out the following ***key practices***.

High Schools That Work—Key Practices

- Setting higher expectations and getting career-bound students to meet them.
- Increasing access to challenging vocational and technical studies, with a major emphasis on using high-level mathematics, science, language arts, and problem-solving skills in the context of modern workplace practices and in preparation for continued learning.
- Increasing access to academic studies that teach the essential concepts from the college preparatory curriculum through functional and applied strategies that enable students to see the relationship between course content and future roles they envision for themselves.
- Having students complete a challenging program of study with an upgraded academic core and a major. An upgraded academic core includes at least four years of college preparatory English and three years each of mathematics and science, with at least two years in each area equivalent in content to courses offered in the college preparatory program. The major includes at least four Carnegie units in a career or academic major and two Carnegie units in related technical core courses.
- Providing students with access to a structured system of work-based and high-status school-based learning—high school and postsecondary—collaboratively planned by educators, employers, and workers and resulting in an industry-recognized credential and employment in a career pathway.
- Having an organizational structure and schedule enabling academic and vocational teachers to have the time to plan and provide integrated instruction aimed at teaching high-status academic and technical content.
- Having each student actively engaged in the learning process.
- Involving each student and his/her parent(s) in a career guidance and individualized advising system aimed at ensuring the completion of an accelerated program of study with a career or academic major.
- Providing a structured system of extra help to enable career-bound students to successfully complete an accelerated program of study that includes high-level academic content and a major.
- Using student assessment and program evaluation data to continuously improve curriculum, instruction, school climate, organization, and management to advance student learning.

Some Cautions

Before we look at our preferred model in greater detail, two cautions should be mentioned.

Caution One: First comes knowledge, then comes application. Students cannot bring their knowledge and problem-solving skills to bear on a problem or theme unless they have first acquired some knowledge and problem-solving skills. You cannot simply devise fun hands-on activities to keep students active and happy and expect achievement of established learning objectives to occur. Learning involves rigor. Activities must be structured to provide application of concepts that have been ***taught*** or to lead to desired ***discoveries***.

This relates to an issue much in the professional literature these days. There was concern in the recent past that students lacked self-esteem, so units and courses in self-esteem were developed and taught. But, asked some of the country's leaders and thinkers, how can you teach self-esteem in a vacuum, separate from achievement? Self-esteem, they say, is earned, not bestowed.

Thus it is with problem solving. To solve problems, student need first to ***work*** to learn basics. Then, and only then, can they apply those basics to the solution of problems.

Caution Two: Don't water down the content. Regardless of what you call the approach (applied academics, vocational-academic integration, etc.), the content must not be diluted. As is made very clear in SREB's key practices, all students—both vocational/tech prep and college prep—need to graduate with the skills required for whatever step comes next. Whether the next step is enrollment at two-year or four-year educational institutions, employment in existing enterprises, development of their own entrepreneurial enterprises, or some other endeavor, students need certain skills. Watered-down academics do not provide a passport to success for any of those options.

For example, if you peruse catalogs of texts from various publishers, you will find the tales of Shakespeare written using "controlled vocabulary." In other words, the basic plot line is provided using very simplified language. Is that Shakespeare? No, it is not. It's like serving a BLT—but without bacon and tomato.

Yes, you need to start instruction at a level that is realistic for students' abilities. But if Shakespeare is part of the curriculum, then the teacher's job is to design activities that will help students deal with the language as is. (Some Ohio teachers, for example, have students work in teams to translate passages using a glossary and then share the results of their efforts.) It is also the teacher's job to help them discover why Shakespeare is still relevant to their lives today.

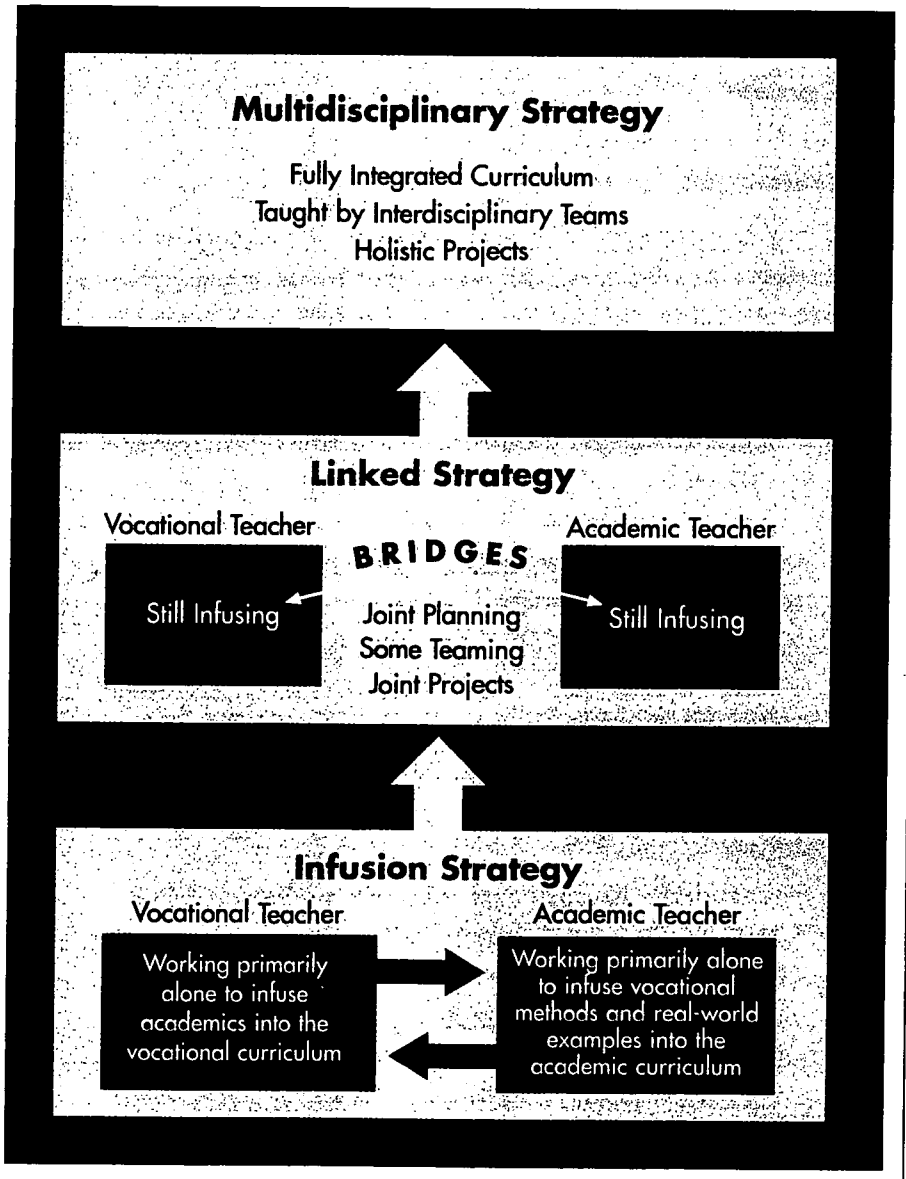
What should be different about ***applied*** academics courses is ***not*** the level of rigor and the challenge of the content. What is different is ***how*** that content is taught: (1) in a hands-on applied manner and (2) with ties to the real world (life skills, occupational content) to the extent possible. Such an approach is more effective not only with vocational/tech prep students but with many college prep students as well.

What should be different about applied academics courses is not the level of rigor and the challenge of the content, but how that content is taught.

Work SITE Tri-Level Model

A simpler model for our purposes—one consistent with the NCRVE and SREB models and particularly responsive to teachers' concerns—is found in *Integrating Curriculum*, developed by Feichtner et al. for School Restructuring Support Associates (1994). The authors describe three levels of integration: the ***infusion*** strategy, the ***linked*** strategy, and the ***multidisciplinary*** strategy.

Our model (based on the Feichtner model) is shown graphically below and described in detail in the remainder of this section.



Maximum Integration

Minimum Integration

If you are a vocational teacher . . .

Infusion Strategy: Applied But Separate

If you are a vocational teacher, at the Infusion level you are reinforcing the use of academics in your vocational instruction:

- You have students use the academic skills as they would on the job: orally communicating directions to another student, writing up job orders, calculating customer billings.
- You are building problem solving and decision making into classroom activities so that when students leave the program they can operate on their own, without teacher direction.
- You are relating your instruction to the real world of work and simulating that environment to the greatest extent possible.

Formulas for Success

The U.S. Department of Labor offers the following ideas for incorporating job-related elements into the at-school experience in their publication, *School-to-Work Connections: Formulas for Success* (1992, p. 13):

- Involve employers in curriculum development and evaluation to ensure that content, expectations, examples, and standards reflect actual worksite experiences.
- Create classroom lessons that reflect the demands of the workplace and convey specific on-the-job performance requirements to students.
- Group various competencies into clusters that are associated with job-specific tasks, and build manageable, interdisciplinary learning activities around the tasks.
- Emphasize demonstrations, performance modeling, and supervisor coaching as the primary means of teaching students.
- Test students in ways that measure such job-specific criteria as performance quality, production rates, safety, customer satisfaction, and manufacturer's specifications.
- Personalize instruction as much as possible. Develop individual learning contracts for training; work in and with small teams; provide support services on a basis that resembles "case management."

- Design learning tasks to reflect and reinforce work tasks. Include basic skills and employability skills in the same process.
- Structure lessons so that students *learn by doing*. Academic lessons should support work-related learning-by-doing rather than the reverse.
- Express lesson assignments as "Work Orders" reflecting those used in industry.
- Emphasize quality and productivity by applying reasonable pressure on students to perform tasks correctly and on time—as determined by industry standards.
- Encourage students to work in teams to complete learning assignments. Be sure to match experienced students with less-experienced students.
- Use actual worksite materials (manuals, installation instructions, safety materials, forms, tools, etc.) as part of routine lesson content.
- Issue supplies, tools, and equipment in a way similar to that of the worksite. Use a work-based requisition process for issuing materials.
- Organize the training area like the worksite for whatever industry you train for. Explicitly discuss the work climate.
- Whenever possible, use real products and "customer relations" between student and customer as part of learning.
- Sustain instruction patterns between instructor and student that mimic those of the worksite (supervisor and worker) in terms of formality, expectations, discipline, and responsibilities.

Bridging the Gap

Note, however, that you ***can't*** reinforce exactly what's going on ***now*** in the academic classes if you have no contact with those classes. So another thing you can do is reach out a friendly hand to the academic teachers who teach your students. For example:

- Invite them into your classroom and laboratory.
- Talk to them in the teacher's lounge.
- Sit with them at social events such as football games.
- Provide them with copies of the texts you use.
- Invite them to participate in meetings of your program's advisory committee or student vocational organization activities.
- Share with them relevant articles from the occupational journals you read.

If you have a problem with this—if you think that you know and can provide all the academics your kids need—then you may need to work on your attitude. A student with minimal mathematics, science, and communication skills will not be prepared for the ***changing*** world of work. Today's world requires lifelong learning. Students cannot, for example, learn to use one particular computer and software package and expect that exposure to serve them for a lifetime. Those who will succeed and advance on the job are those who can think and grow. To develop professionally, they need academic skills. Workplace literacy programs are thriving today for that very reason—too many workers do not have sufficient reading, writing, mathematics, and science skills to participate in the training required for using new equipment and technology.

Just as you are a specialist--an expert--so are the academic teachers. Support each other, and the sum will be greater than its parts.

Higher-level academic skills also prepare students for required life skills: participating productively as a citizen; managing home and bills and taxes; identifying and pursuing interesting hobbies and leisure activities.

Just as you are a specialist—an expert—so are the academic teachers. Support each other, and the sum will indeed be greater than its parts.

But wait! If you are an applied academics teacher, did you skip the paragraphs above that pertained to the vocational teacher because they "weren't relevant to your needs"? If so, go back and read them now. If you are a vocational teacher, don't stop reading now just because the next paragraphs are addressed to applied academics teachers. It's easy to blame the administration for all the barriers to integration (no time, separate facilities, etc.), but the ability to integrate also rests on each teacher's willingness to step outside his/her own specialty and consider the rest of the world. This is Rule #1 on the road to integration.

If you are an applied academics teacher . . .

If you are an applied academics teacher, at the Infusion level you are trying to apply your content to an occupational area about which you may know a great deal, a little, or nothing. What can you do when you don't know anything about the occupational content and you don't have easy or regular access to the vocational teacher? Actually, there are lots of things you can do.

Provide a Work-Like Setting

The ideas suggested by the U.S. Department of Labor for vocational teachers (see pp. 24-25) also apply, in a sense, to academic teachers. That is, if you want to make instruction more real and relevant, then you need to provide a work-like setting. Here's how:

- Focus less on "concocted" educational experiences, and spend more time devising active and "real" learning experiences for students.
- Provide ample opportunities for students to work in teams, as well as individually, and to "make meaning" with their academic skills.
- ***Teach*** less and focus more on making it possible for students to ***learn***.

Visit Job Sites

The "Connecting" component of Ohio's Work SITE Learning Model is a model for teacher externships. Through this component, teaching teams made up of a vocational teacher and his or her academic counterparts visit area businesses, industries, and community-based organizations to observe and discuss with employees how academics are used on the job. Such activities can help you identify relevant academic content and ways in which to tie that content to the workplace within your academic instruction.

If this option is not available to you, you may be able to find alternatives. For example, if you are teaching science to students in a culinary arts program, you may know someone who is a chef, who would be willing to help you.

Another source for job site visits is the advisory or craft committee for the vocational program. Such committees are made up of local employers who, as their name suggests, serve in an advisory capacity for the vocational program. They may review curricula, judge contests, donate equipment, provide co-op work opportunities, serve as guest speakers, and the like. If you are willing to spend the time, members of these committees might happily provide you with a Saturday on-the-job experience.

Review the Relevant Vocational-Academic Task Lists

Vocational instruction in Ohio is structured using vocational-academic task lists. Initially, these were the Occupational Competency Analysis Profiles (OCAPs), each one covering an occupational area (e.g., culinary arts). As part of Ohio's emerging model—Career-Focused Education for Ohio's Students—Integrated Technical and Academic Competencies (ITACs) at the core, career cluster, and specialization levels are replacing the OCAPs. The differences between these two approaches is shown in the chart on the following page.

Excerpts from the Business Administration and Management OCAP are provided in the last section of this document.

The OCAP or ITAC document provides an important frame of reference for curriculum planning—whether vocational or academic. OCAPs and ITACs start with what students need to ***do*** on the job (competencies) and then identify the occupational and academic knowledge, skills, and attitudes needed to perform those competencies. By reviewing these documents, applied academics teachers can focus instruction—at least in part—on the ***actual tasks*** students must perform in the work world or in life (write a convincing memo, calculate the amount of materials needed to perform a particular job, solve problems on-site using knowledge of scientific principles) and then teach the English, mathematics, or science skills and concepts as they are needed in relation to the tasks.

Applied academics teachers need to focus instruction on the actual tasks students must perform in the work world or in life and then teach the academic skills and concepts as they are needed in relation to those tasks.

For example, have students complete a mileage reimbursement form from an actual job. Teach the mathematics in relation to that task. Better still, help them discover the principles themselves—help them to think mathematically, to define and answer their own questions. Bring in ethics: Would it be right to charge the company mileage for a side trip to run some errands?

An Enhanced Curriculum Model

Building From . . .	Moving Toward . . .
• Ohio Competency Analysis Profile (OCAP)	• Integrated Technical and Academic Competencies (ITAC)
• Competencies designed specifically for occupational programs	• Three different types of ITACs: 1. Core ITAC: Competencies addressing what all students need to know and be able to do 2. Cluster ITAC: Competencies common across occupations within a career cluster 3. Specialization ITAC: Competencies for specific occupations
• Competencies defining state standards	• Competencies directly linked to national academic, employability, and occupational standards, where they exist
• Validation by a panel of business and industry representatives	• Teacher involvement in the development of competencies; then validation by a business and industry panel
The Look of the List	
• Competencies listed independently of workplace context	• Competencies identified along with *statements of expectations* and *scenarios* to describe workplace context
• Separate lists of occupational, employability, and academic competencies	• List that integrates occupational, employability, and academic competencies
• List organized by— ✓ Units ✓ Competencies ✓ Competency Builders	• List organized by— ✓ Strands/Units ✓ Competencies ✓ Key Indicators
How the List Is Used	
• Competencies designed principally for 11th- and 12th-grade programs	• Competencies designed to be used flexibly in career-focused education
• Competencies to be used principally by vocational and applied academics teachers	• Core competencies to be used by all teachers; core, cluster, and specialization competencies to be used in career-focused education, including vocational and applied academics courses

Make Contact with Your Students' Vocational Teachers

If you have never met your occupational counterpart, take the initiative. Feedback from academic and vocational teachers indicates that there are some barriers typical to any situation involving "us" and "them." Vocational teachers who came to teaching straight from industry say that the academics look down their noses at them because they took an alternative route to certification. Academic teachers say that vocational teachers look down their noses at them because of their lack of technical know-how. On the other hand, teachers who participated in integrated teaching teams as part of the Work SITE or Buckeye Hills Collaborative Partnership (BHCP) project found it easy to work together and developed mutual respect rather quickly.

It's mostly a matter of taking that first step and turning a stranger into a friend. Be creative in your attempts to make contact. You know best what would feel comfortable for you and what the limits and possibilities of your particular situation are. Some possibilities:

- ***Let students be the messenger.*** Consider making comments in class that show respect for students' vocational instructors; such messages will likely get back to those teachers. Or, when students ask questions that cross over into occupational content, ask them to get the answer from their vocational teacher and then explain it to you during the next class session. (But don't overdo this. You want to show that you value the teacher's expertise without overburdening him or her with questions coming from your class.)
- ***Set up a shared bulletin board.*** If you share a teacher's lounge but not a common planning time, try setting up a bulletin board where you can communicate. A mathematics teacher could, for example, post a note such as the following: "About to teach formulas involving fractions. Need examples of how that would be used in accounting." Or teachers could post the key concepts they're covering with each class that week in order to promote more correlation between classes.

Working together is mostly a matter of taking that first step and turning a stranger into a friend. Be creative in your attempts to make contact. A little contact can go a long way.

- ***Set up meetings.*** Identify times when you can meet with the vocational teacher. At the very minimum, you could arrange to visit the vocational classroom or lab occasionally during one of your planning periods. Or perhaps the two of you can pick a day when you could meet there for an hour after school to discuss your mutual students. If possible, arrange to have someone—fellow teacher, department head, curriculum specialist—cover one of your classes for a period so that you can visit the vocational class while your students are there. Similarly, invite the vocational teacher to visit your classroom when you are teaching his or her students. With the vocational teacher's permission (or at his/her invitation), attend meetings of the program's advisory or craft committee.

  A teaching team from Belmont-Harrison Career Center (St. Clairsville, Ohio) took advantage of the fact that advisory committee meetings for three programs were scheduled on the same night as Parent-Teacher Conferences when all teachers would be in attendance. Academic teachers with (unfortunately) few parents to meet with were able to attend portions of the advisory committee meetings. They explained their curricula and, in turn, got some ideas about what employers expect of workers in the area of academics. Both academic teachers and advisory committee members were pleased to have had this chance for interaction.

- ***Seize the moment.*** Identify a specific question you need help with, and pick up the phone. Or leave a note in the vocational teacher's school mailbox. Or send e-mail if that's an option. Don't impose, just open up the door to future communication.

Even if your schedule and location are not conducive to such activities, don't give up. A little contact can go a long way. If you can't meet very often, just getting materials from the vocational program can help you better relate your instruction to students' occupational interests.

Read Occupational Materials

Depending on your aptitudes and willingness to spend extra time, this could be a major undertaking or a casual and occasional activity. An applied science teacher, for example, who expects to be teaching computer programming students year after year and who is interested in computer programming might choose to do some heavy reading in the area. But an applied communications teacher who works with students from different occupational programs each year and who has little interest in computer programming might take a lighter approach.

You need to be realistic about this. You were hired to be an academic specialist, not a vocational teacher, but a little effort can go a long way. It's sort of like buying a phrase book before visiting a foreign country. It's amazing how warmly you are received when you make an attempt to say simple things like *hello* and *thank you* in the native language.

Do you know what jobs students can get by training in the occupational area? Do you know what those jobs pay? If not, you should spend a little time looking at a general reference for occupational information, such as the *Occupational Outlook Handbook* or the *Dictionary of Occupational Titles* (DOT).

One useful source for information in this area is the Occupational Information Network (O*NET), a fully automated relational database available on CD ROM or diskettes (with selected products available on the Internet for downloading free of charge). O*NET is designed to replace the DOT and to provide the flexibility to capture rapidly changing job requirements now and into the 21st century. This comprehensive database identifies and describes occupations, worker skills, knowledges, abilities, and workplace requirements for jobs across the country in all sectors of the economy.

O*NET
<http://www.doleta.gov/programs/onet>

America's Career InfoNet—part of the America's Job Bank network—is a comprehensive source of occupational and economic information. If you want to know the fastest growing jobs in America, what they pay, and what training is required to succeed in these occupations, this Department of Labor Website is the place to go.

America's Career InfoNet
<http://www.acinet.org/acinet>

Ohio Career Information System (OCIS)
<http://www.ode.ohio.gov/www/sd/ocisl.html>

In Ohio, another source of this type of information is the Ohio Career Information System (OCIS), a computer-based system that allows students—and others—to look up career information, including specific college, financial aid, and occupation-specific information to aid them in making the correct choice for their future.

Vocational & Technical Education and Careers
<http://votech.miningco.com>

Career information is also available through miningco.com's Vocational & Technical Education and Careers Website. The site includes links to information in the areas of Business and Finance, Food and Beverage, Sales and Retail, and Travel/Tourism/Hotel. There's conference information, timely articles, a career planning tool kit, and the opportunity to subscribe to *Votech Education*, a free e-newsletter.

One Ohio teaching team developed a plan for using tech prep inservice meetings to provide home school academic teachers with academic information relevant to one occupation. The plans called for holding separate meetings for teachers from each academic area—mathematics, English, and science. At these meetings, academic teachers would receive lists of the academic skills needed by workers in the occupation and real-world applications for those skills. Vocational teachers would be on hand at these meetings to discuss the tasks and answer any questions.

Draw on Your Students' Developing Expertise

This may be the most effective strategy you have at your disposal because it not only provides you with the occupational content you need but it also involves students actively, helps them process what they know, and develops their self-esteem. Too often teachers—particularly new teachers—are afraid to let students know there's anything they don't know. They're afraid that if they let down their guard and admit their ignorance, students will not respect them.

Everyone is sometimes a teacher and sometimes a learner.

But in the workplace, it is important to know when to consult others who have expertise you lack. Bluffing on the job can be dangerous. As a teacher, you can model an important workplace skill if you sometimes step into the role of learner and let students teach you about their occupational skills. Not only will you not lose their respect, on the contrary, students will likely respect your cleverness in recognizing how clever they are. Furthermore, you will be modeling the necessity of lifelong learning. Everyone is sometimes a teacher and sometimes a learner in this world—except in America's traditional classrooms.

There are many ways to use student expertise as a resource. For example:

- ***Workplace scenarios.*** The Ideas section of this document provides a number of activities in which students develop workplace scenarios that can form the basis for a variety of classroom activities.
- ***Student presentations.*** Instead of having students in applied communications classes make the typical oral presentations on "What I did on my summer vacation," consider having them do presentations or demonstrations on skills they've learned in their vocational classes. To ensure that students stay engaged while others present (good practice for the listening skills needed on the job), have them complete evaluation forms, rating the presenter's performance against established criteria.

  Such presentations will teach you a lot about the occupation your students are studying, and they will teach students how to communicate effectively. Their assignment is to explain an occupational concept or demonstrate an occupational skill so that you—an occupational "illiterate"—can understand. If at the end you still don't understand, they have not communicated effectively.

  Is this a waste of their time? Certainly not. Being able to explain a task clearly to a coworker is a skill they will likely need on the job. Furthermore, studies have shown that when students tutor others, it is the ***one doing the tutoring*** who benefits most. In order to teach someone else, you need to organize your own knowledge, which strengthens your understanding and cements the knowledge more firmly in your mental database.

- ***Student discussions.*** When you start a unit on a particular concept, start with student discussion. In a mathematics or science class, for example, begin the unit by asking what students already know about the concept to be addressed? Where have they encountered it in their vocational classes or outside of school? If the concept sounds foreign to them, you may need to prompt them to discover relevant examples. Then use the examples—perhaps full-blown student-developed scenarios—as the foundation for instruction. Or give students assignments to complete in the vocational lab (e.g., write a program to determine accrued interest on a car loan of $15,000 for 5 years at 9% and bring the numbers back to me tomorrow).

Using the expertise of students may be particularly helpful for the academic teacher who has students from many vocational areas in a single class. Correlation is more difficult when there are multiple areas to deal with, and it is unlikely that the academic teacher will be able to develop expertise across all areas. Students in this situation can also profit from the expertise of their peers. For example, the business student who sees a demonstration by an auto mechanics student on how to change the oil in a car can use that knowledge, if only to talk to his or her mechanic more intelligently.

A teaching team from EHOVE Career Center (Milan, Ohio) used teacher exchanges to increase the applied academic teacher's knowledge of one occupational area—with students serving as the "experts" in the vocational lab. As originally planned, the applied academic teacher would exchange positions with the vocational teacher for one class period per week over an 8- to 10-week time span. The administrator was concerned about whether students would be learning in both classes if this were to occur—a valid concern.

To ensure that students were in fact in good hands, the following approach was used:

- Students were given specific lab assignments by the lab instructor—assignments involving skills they had already performed safely and satisfactorily under the supervision of the vocational instructor.

- The two instructors met in the lab to discuss lab policies and procedures. The vocational teacher pointed out areas where problems could occur and how to prevent or handle them. They also met for 15-20 minutes before each exchange to discuss specific concepts that might be observed in the lab.
- The applied academics teacher observed student performance, while ensuring that all lab policies and procedures—particularly those related to safety—were followed. The teacher also ensured that relevant academic skills were applied and reinforced.
- The vocational students taught the applied academics instructor about the occupational procedures and techniques they were using. This reinforced for the students some concepts from the applied classes and enhanced their self-image and their ability to communicate.
- In this particular case, the vocational lab included seniors in the program, while the academic class consisted entirely of juniors in the program. Thus, the vocational teacher used the academic class time to teach occupational skills involving application of specific academic skills. Had the academic class been made up of students from many vocational programs, however, the vocational teacher could have focused on demonstrating how academic skills and content previously covered in the class could be applied in occupational contexts.

The team has the following recommendations for improving this activity in the future:

- Plan the exchanges when students have already started on projects in the vocational lab—after the vocational instructor has had time to work with them a bit and answer any questions they may have.
- Allow a minimum of 5 days for exchanges, but an exchange over 10-15 days is preferable. And follow a continuous daily schedule, rather than exchanging classes one day a week for 5 weeks. These practices would make it easier to identify the logical progression and continuity of the concepts being observed.

Computer programming students could code mathematics formulas (e.g., for calculating sales tax or the amount of a markdown) and teach the mathematics teacher how to calculate using BASIC.

Caryn H. Jackson
Math/Science
Tolles Technical Center

Collaboration begins with attitude.

Linked Strategy: Collaboration and Cooperation

One Ohio applied mathematics teacher—who teaches horticulture students in collaboration with their other teachers—suggests that a key to his success is that he thinks and talks in terms of "my horticulture class," not "my juniors now in mathematics class." True collaboration begins with this kind of mindset. Students in a vocational program have, in essence, selected a major. Regardless of which class they are in, they are business or marketing or culinary arts students. When the applied academics teacher operates from that viewpoint as well, students are more likely to feel that the teacher has a genuine desire to teach them (i.e., wouldn't rather be off teaching "real" academics to college prep students). This perception, in turn, may help students to accept academics as relevant.

Joint Planning

At the Linked level, vocational and academic teachers work together. This may mean that an applied communications teacher meets periodically with the vocational teacher to plan jointly. Joint planning might also involve the vocational teacher and ***all*** applied academics teachers—mathematics, science, and communications. Such planning can help ensure that their instruction dovetails in a general way and that each teacher reinforces what the other has taught. As part of joint planning, the vocational teacher can identify occupational materials and authentic materials from the job that can be used in academic classes.

A teaching team from Pioneer CTC (Shelby, Ohio) developed a plan for securing some common planning time. They were eager to plan jointly, but the schedule just did not allow for that to happen. In looking at options, they wondered whether they could use inservice time for planning. (The district requires teachers to obtain 12 hours of professional development outside school hours.) They spent time building a case for this plan, focusing on the benefits to students if teachers coordinated their curricula and had time to develop a team feeling. As they planned, they became more and more enthusiastic, and all kinds of possibilities came to mind. When they presented their idea to their supervisor, he shared their enthusiasm. The team was

pleased that their idea was so well received, and they began to make plans for implementing their idea during the next school year.

Like the Pioneer CTC teaching team, a team from Springfield-Clark County JVS (Springfield, Ohio) presented their associate director with plans they had developed for securing common planning time. They presented a number of options (e.g., paid extended time in summer or extended day, one day a month of coordination time, shortened instructional periods). However, at that time, using their periodic professional days for joint activities was the only realistic option. They proposed using these days in two ways: (1) all three teachers secure a professional day and use it to develop joint plans and coordinate instruction; and (2) one teacher secures a professional day and uses it to be part of his/her counterpart's classes for the day (e.g., the applied mathematics teacher spends the day in the marketing classes). The team was allotted two professional days initially for the development of joint plans.

A Belmont-Harrison JVSD teaching team sought and received permission to lead an inservice activity in which academic-vocational teams would have the chance to develop short, integrated lesson plans.

Joint Projects

Plans may also involve student activities or projects that are guided and graded by both the academic and vocational teachers. For example, students could work with the vocational teacher to pick a topic to research. The applied communications teacher could then work with students on the skills needed to conduct the research and develop a report (library skills, notetaking, outlining, bibliographical form, etc.). Mathematics and science teachers could serve as advisors when an aspect of the research touches on those areas. Once completed, the reports could be graded by both the applied communications teacher (for its adherence to the criteria for a good research report) and by the vocational teacher (for its technical accuracy and worth).

For example, a joint project in business/office education could focus on having students develop a plan for adding a PC station to the business lab:

- Vocational Class: Students could identify the intended purposes of the PC station and the various types of equipment/components and furniture that could fulfill those purposes. Desirable characteristics of each of the elements that make up a PC station could be explored. Possible locations for the station could be considered.
- Science Class: Students could study such topics as the effect of relative humidity on computer equipment, ergonomics, and wiring load.
- Communications Class: The teacher could provide information on information-gathering, including the need to outline questions you want answered ***before*** calling or visiting a vendor. Procedures could be provided for telephone and in-person fact-finding interviews and use of the Internet. Students could then research equipment and furniture to identify what is available. They could be asked to summarize their findings in writing and to compare/contrast the strengths and weaknesses of the various types and brands of equipment and furniture.
- Math Class: Students could measure the area to determine space limitations and estimate and compare/contrast costs of various equipment and furniture.
- Joint Work: Teams of students could each develop a detailed written proposal for the PC station, including an introduction, description, options, references, time requirements, payment requirements, and final costs. Work on this proposal could occur across classes. Oral presentations to a "client" could be the final requirement. The best proposal (as measured by such criteria as reasonable cost, equipment compatibility, extent to which proposal meets identified purposes, etc.) could be selected by the team of teachers and "client."

One problem some teams have to deal with in trying to carry out major projects crossing all disciplines is that students at the school take, for example, science only in their junior year, and communications only in their senior year. One solution is to have students maintain a project notebook in which they keep track of the necessary forms, diagrams, notes, and examples for continuity and clarity over the two years of study.

Team Teaching

Collaboration and cooperation may also move beyond mere planning into team teaching. Teaming can take many forms. Teachers may team teach only occasionally, perhaps to introduce a particular unit. Or, if the school structure allows, they may spend a great deal of time in each other's classes and labs. Ohio teachers who have done this are enthusiastic in describing the difference this makes for students—in terms of both learning and attitude. The advantages are numerous:

- Having more than one teacher available allows more individual attention to be given to students.
- When teachers who share the same students function as a unified team, there tend to be fewer discipline problems.
- Teaming models and strongly underscores the relationship between academic and vocational skills. As mathematics or science concepts surface in the lab, the academic teacher is there to help.
- The applied teacher becomes more occupationally literate and gathers examples with which to illustrate concepts in academic classes.

Building of Administrative Support

Clearly, time and location are key aspects of collaboration. A mutual planning period is a must. Block schedules that give teachers flexibility can make an enormous difference. Assume, for example, that science and culinary arts are scheduled back to back in the same area of the building, and that each teacher is free during at least part of the other class. Imagine the possibilities! The teachers could serve as "aides" in each other's class. Or they could plan to extend a science lesson into the culinary arts period, or vice versa, when a particular instructional piece warrants it.

Hint: Approaching an administrator with ideas for overcoming the problems with his/her school is likely to prompt a defensive reaction. It's usually best to focus on how your recommended changes will benefit the school and the students in specific and tangible ways.

If you have trouble moving to the Linked level because of lack of administrative support, a helpful resource is *Integrating Academic and Vocational Education: Guidelines for Secondary School Principals* by Schmidt et al. (Berkeley, CA: NCRVE, 1992). Giving your principal a copy or using it to prepare a presentation for that principal could make a difference. The document presents a wealth of good information in a short, punchy style. One section spells out the barriers to integration and—even more important—suggests reasonable strategies for pulling down those barriers. The various chapters walk the administrator through the steps to integration clearly and simply.

Teaching teams involved in Ideabook development who sought support for common planning time (as described earlier) reported a very real benefit. Even though they were unable, on short notice, to secure regular, formal common planning periods, they did find administrative support. Administrators were impressed with the teacher collaboration shown, the plans made, the enthusiasm of the teachers, and their focus on the benefits to students. Teachers, in turn, found out the constraints facing the administrators (e.g., how truly complicated the scheduling process is). A foundation was established for increasing options for common planning in the future.

The team from EHOVE Career Center that secured administrative approval for teacher exchanges suggests that it is important to know the "style" of your administrators. Will they be more receptive to a formal written plan, or to an informal face-to-face meeting? How receptive are they to change? If they are not quick to accept changes, consider starting small.

Multidisciplinary Strategy: Fully Integrated Curriculum

The Multidisciplinary level is where the academic-vocational walls come down, both literally and metaphorically. Through a school-within-a-school or cluster structure, students are assigned to an occupational program taught by a team of teachers—academic and vocational—working together to provide instruction. The academic teacher no longer reports to a department chair in his/her academic area; the vocational teacher no longer reports to a vocational supervisor for his/her area. Instead, a team leader is selected on the basis of leadership skills, and that person's specialty may be vocational or academic. In some integration models at this level, students stay with the same team of teachers for the two or three years of the program.

Schoolwide Projects

In some schools, projects provide the focus for all instruction. At Rindge School of Technical Arts in Cambridge, Massachusetts, for example, all ninth graders are involved in a project called *CityWorks* in which the "text" is the city itself. Students spend a portion of each school day carrying out projects related to the city with the coaching of their teachers. In this case, the walls have come down not only between disciplines but also between the school and the community. Tenth graders at Rindge focus on constructing electrical vehicles, and all instruction supports successful completion of that task.

Projects can cross the lines between occupational areas. When a school focuses on a major project, students in different areas can each bring their growing expertise to bear on its completion. Imagine, for example, a school project to turn a vacant lot into a city park. Students in social studies or communications classes could devise surveys to determine what the citizenry would desire in such a park. Students in marketing classes could develop a publicity campaign for the effort. Students in horticulture classes could design and develop the landscaping. And on and on and on. Just as in real life, there would be a role for most specialties in any complex project. And just as in real life, those roles interact.

> Three-quarters of the students who train in a particular field never work in that field for a single day once they leave school. And the average American changes jobs seven times in a lifetime. Narrow, job-specific training for entry-level jobs is an anomaly. Broad, industry-wide training is what is needed. . . . Vocational education's greatest strength is not putting kids in jobs, it's its methods.
>
> Larry Rosenstock,
> Executive Director
> Rindge School of
> Technical Arts

If this sounds exciting to you, consider going online at <www.bpic.org>, clicking on "Resources," and downloading *The VIA Book: A Best Practices Manual from the Vocational Integration with Academics Project at the Rindge School of Technical Arts* and *The New Urban High School: A Practitioner's Guide*. These highly readable books are full of interesting and useful information, as well as vivid examples of integrated problem- and project-based learning at its best. The resources also include an excellent two-page worksheet for principals to use in assessing how well their schools meet New Urban High School principles, which includes values such as providing common planning time for teacher teams—a great device to share with your administrators!

Individual Projects

In other schools, it is the senior year that is project-based. The senior project is often an individual activity, providing a capstone experience and forcing each student to apply all that he or she has learned. It is an authentic, real-world project leading to a new discovery or a usable product. Teachers serve as advisors. Students are encouraged to make use of the expertise of their peers on particular aspects of their projects (within reason, of course), just as they would in the real world of work. Often, the culmination of the senior project is a major report and an oral presentation, with individuals from business and industry serving as judges.

School-Based Enterprises

David Cairns, applied mathematics teacher at Warren County Career Center in Lebanon, Ohio, suggests that a laboratory-based, student-operated business (with customer service) can also provide a fully integrated curriculum. In this approach, students rotate on and off the floor to remediate, prepare for proficiency and Work Keys exams, and meet curricular requirements. Applied academics teachers act as supervisors in the laboratory-business, teaming with the vocational instructor and with each other.

Where Do You Go from Here?

You've had a brief look at the three levels of integration: Infusion, Linked, and Multidisciplinary. Which level best describes your present situation? What steps can you realistically take to move to a more integrated approach at that level or to move to the next level? The rest of this document is designed to help you answer these questions.

On the next few pages are listed numerous references that can help you learn more about the process of integration. Many of these are filled with real-life examples of the exciting things schools are doing to integrate instruction. Many present hard data documenting that integration can make a difference, not just in students' attitudes, but in their standardized test scores.

The third section of the Ideabook presents strategies and activities you can use to make academic instruction more integrated, more authentic, more relevant to students' occupational programming. You can use them "as is" or adapt them to your particular situation. Some are related to a specific academic area; some cross disciplinary lines. For example, teaching students to think consciously about the thought processes they use (metacognition) helps them learn how to learn. And you can't modify instruction without modifying the way in which you measure student learning; thus, one "idea" focuses on the use of authentic assessment.

The fourth section is about the Information Superhighway—the Internet. You'll find information about the World Wide Web, e-mail, newsgroups, and mailing lists (or listservs), and an abundance of Internet addresses that will get a user quickly to the wealth of educational resources available on the Web.

The fifth section provides a list of curricular resources for applied academics. It's toward the end for a reason. Historically, instruction starts with a textbook. The new teacher is given a text and designs lessons around use of that book, too often in just the order it dictates. But we're talking about a different approach to instruction here, one that starts with the skills students need to survive and thrive in life and at work. It starts with authentic tasks. Materials, then, should be selected to support the mastery of those tasks—preferably a wide variety of materials and preferably some that are authentic (i.e., obtained from the world outside the classroom).

The final section of the Ideabook contains ***excerpts*** from a relevant Ohio-developed Occupational Competency Analysis Profile (OCAP), one key source of information about the occupational, academic, and employability competencies for a given occupation.

Additional References

For more information about academic-vocational integration, consider the following sources:

Allyn & Bacon, Longwood Division
Phone: 800-666-9433; Fax: 515-284-2607
E-mail: <simon@neodata.com>
Website: <http://www.abacon.com>

✓ *Interdisciplinary High School Teaching: Strategies for Integrated Learning*

This guidebook includes ten full-length case studies from real classrooms, plus vignettes and illustrations submitted by hundreds of teachers. Topics include current developments in interdisciplinary and project-based learning, involving multiple intelligences in the learning process, critical thinking, and problem solving. Throughout, the focus is on showing how classroom learning can be invigorated by emphasizing connections between subject areas, the process of learning, and the world of work.

Association for Career and Technical Education (ACTE) Product Sales
(Formerly the American Vocational Association/AVA)
Phone: 800-826-9972; Fax: 703-683-7424
Website: <http://www.acteonline.org>

✓ *Teaching for Understanding Through Integration of Academic and Technical Education*

Explains clearly what integration is and isn't, why it makes sense, what conditions support effective integration, and the ten steps for getting started. Actual high school programs are highlighted.

✓ *Making the Case—for School-to-Careers and Vocational Education*

Demonstrates the value of blending academic and vocational-technical education and debunks outdated stereotypes. Also provides step-by-step instructions for planning promotional campaigns and events that will get media attention and draw public support. Includes a gold mine of positive examples of real programs, solid statistics, and other information nuggets that make the case for strong school-to-careers and vocational education programs.

Instructional Materials Laboratory
University of Missouri–Columbia
Phone: 800-669-2465
E-mail: <iml@tiger.coe.missouri.edu>
Website: <http://iml.coe.missouri.edu>

✓ *A Practitioner's Guide to Integrating Academics*

This how-to manual defines integration, looks at its benefits, examines issues that must be addressed for it to succeed, provides several models for developing integrated instruction, and discusses assessment (of programs, teaching, and student work). Case studies illustrate integration in action and provide helpful tips.

National Center for Research in Vocational Education (NCRVE)
Materials Distribution Center; Western Illinois University
Phone: 800-637-7652; Fax: 309-298-2869
E-mail: <NCRVE-MDS@wiu.edu>
Website (Publications Search Program):
<http://ncrve.berkeley.edu/#pubs>

✓ *Achieving Integration Through Curriculum Development: Videotape of 11/24/92 Teleconference*

✓ *Annotated Resource List: Integration of Academic and Vocational Education*

✓ *Assessing the Integration of Academic and Vocational Education: Methods and Questions*

✓ *Blurring Academic and Vocational Boundaries: Barriers in the Cultures of Large High Schools*

- ✓ *But I've Been Doing This for Years: Informal Integration of Vocational and Academic Education Pilot Test Report*
- ✓ *Case by Case*
- ✓ *Case Studies of Urban Schools: Portrayals of Schools in Change*
- ✓ *The Challenge to Change*
- ✓ *Collaborative Efforts Between Vocational and Academic Teachers: Strategies that Facilitate and Hinder the Efforts*
- ✓ *The Cunning Hand, the Cultured Mind: Models for Integrating Vocational and Academic Education*
- ✓ *Examples of Integrated Academic and Vocational Curriculum from High School Academies in the Oakland Unified School District*
- ✓ *General Education: Vocational and Academic Collaboration*
- ✓ *Helping Teachers to Understand Their Roles in Integrating Vocational and Academic Education: A Practitioner's Guide*
- ✓ *Helping Vocational and Academic Teachers Collaborate to Improve Students' Reading and Writing Skills: An Over-Time Inservice Activity*
- ✓ *Integrating Academic and Vocational Education*
- ✓ *Integrating Academic and Vocational Education: A Review of the Literature, 1987-1992*
- ✓ *Integrating Academic and Vocational Education: Guidelines for Assessing a Fuzzy Reform*
- ✓ *Integrating Academic and Vocational Education: Guidelines for Secondary School Principals*
- ✓ *Integrating Academic and Vocational Education: Issues in Implementing the Carl Perkins Amendments of 1990*
- ✓ *Integrating Academic and Vocational Education: Lessons from Eight Early Innovators*
- ✓ *Integrating Academic and Vocational Studies*
- ✓ *Integration of Vocational and Academic Education: Theory and Practice*
- ✓ *Making High Schools Work: Patterns of School Reform and the Integration of Vocational and Academic Education*
- ✓ *National Roster of Local Practices in the Integration of Vocational and Academic Education*

- ✓ *Preparing Teachers to Successfully Integrate Vocational and Academic Education: A Case Study Approach*
- ✓ *Teachers' Roles in the Integration of Vocational and Academic Education*
- ✓ *Two Worlds: Vocational and Academic Teachers in Comprehensive High Schools*
- ✓ *Using Professional Development to Facilitate Vocational and Academic Education Integration: A Practitioner's Guide*
- ✓ *Vocational and Academic Teachers Work Together*
- ✓ *What Works When Teachers Integrate Vocational and Academic Integration*

Southern Regional Education Board (SREB)
High Schools That Work (HSTW)
Website: <http://www.sreb.org/programs/hstw/high.html>
High Schools That Work in Ohio
Website: <http://www.ode.ohio.gov/www/ve/pathways/hstw/hstw.htm>

Over 40 Ohio school districts are involved at some level in SREB's *High Schools That Work* initiative, which was described by *USA Today* as the "most ambitious and most successful dissemination" of vocational and academic integration in the nation.

HSTW member schools receive the following materials at cost:

- ✓ Guides for planning and implementing *HSTW* in local schools and districts
- ✓ Research reports on programs in improving student achievement
- ✓ *Outstanding Practices*, an annual publication of successful strategies from *HSTW* sites
- ✓ *Update* newsletters on progress of *HSTW* sites and students
- ✓ Announcements of the annual Staff Development Conference and other staff development activities
- ✓ Directory of *HSTW* State Coordinators

Non-members can access these materials through a subscription (currently $75). Ohio educators can also peruse *HSTW* materials by visiting the Reference Library in Room 907 at 65 S. Front Street, Columbus, Ohio. (Hours are 8:00–5:00; Phone: 614-466-3430)

Insert the
"Integration Ideas:
Activities and Strategies"
Tab Here

Integration Ideas: Activities and Strategies

The ideas in this section are intended to "prime your mental pump"—to give you some starting points for thinking about the activities you will develop for your own program. Although the specific examples used to illustrate each of the following ideas may relate to a single academic or vocational area, the ideas are, for the most part, applicable to all applied academic and vocational teachers.

Some "ideas" are in the form of strategies. Teaching thinking strategies and using authentic assessment, for example, are instructional strategies that are gaining wide use in education. They are included here because they are particularly well suited to integrated programs in which activities and materials are authentic and learning is collaborative.

Other ideas lend specific support to the process of integration. Devices are provided that guide you in looking across disciplines and incorporating relevant materials and concepts as you carry out your instructional planning. Lesson plans developed cooperatively by academic-vocational teaching teams are presented. A sampling of interesting integrated classroom activities are described.

As you look through these ideas, remember: This is just the starting point. With your subject-matter expertise and the collaboration of the other teachers who share responsibility for your students, you should be able to go well beyond these ideas (remembering, of course, that Rome wasn't built in a day).

Teach Thinking Strategies

Teaching students to analyze their thought processes can help them learn how to learn. When you were a student, did you ever have one of those golden mathematics teachers who could look at your incorrect answer and tell you exactly ***where*** you went wrong in your calculations—in your thinking? Such information was far more helpful than just knowing that the answer—the product—was wrong.

Monitoring, thinking about, and questioning the way we process information is called metacognition.

We sometimes tend to focus in class on the correct answer or the desired product, but the process used to arrive at that result is equally as important. As learners, students need help in focusing on process—on identifying the process they are using—and learning to use analysis of process to improve performance. By helping students monitor, think about, and question the way they process information—called *metacognition*—we can "help them become more independent learners who can recognize and correct their own processing errors."[1]

Metacognition Techniques

One good way to teach thinking strategies is to model them. As you carry out a process in your teaching, think aloud. Explain what's going on in your head—not just what you're doing but how you're mentally ***deciding*** what to do (and what not to do).

Another way to teach thinking strategies is to involve students in a process and then to stop instruction periodically to ask students to look at what they did, what they experienced, what they felt. "In this way, provided there is a general atmosphere of relaxed alertness and trust, students move to deeper levels of understanding because the experience includes dealing with the impact of the process on themselves, including emotional involvement. . . . Students learn the process not as an abstract concept but in relation to their own thinking and behavior." [2]

1 J. W. Philippi, "Developing Instruction for Workforce Literacy Programs" (Springfield, VA: Performance Plus Literacy Consultants, 1989), p. 6.

2 Excerpted from R. N. Caine and G. Caine, *Making Connections: Teaching and the Human Brain* (Alexandria, VA: Association for Supervision and Curriculum Development, 1991), pp. 148, 151, and 169-170. (ED 335 141)

This method works very well for skills such as industrial bed making. By thinking aloud, I show students how I mentally go from step to step and what I'm looking for.

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Hotel Operations & Hospitality
Scarlet Oaks Career Development Campus

Sample Metacognition Activity

Assume that students in your classes have difficulty locating information on tables or charts or in interpreting that information. Maybe no one ever walked them through the mental processes used to deal with tables. Just saying, "This is a table, and it provides these pieces of information" is not enough for some students. You need to model the whole mental process used. For example:

- Select a table, preferably an authentic one used on the job.
- Give copies of the table to all students.
- Identify the piece of information you want to find using the table.
- Go through the process of finding that information, explaining out loud what you are thinking as well as what you are doing. Do not make any of the "automatic" leaps you usually make as a skilled table reader. Keep it very basic, and spell everything out.

  For example, the exact term or phrase you are looking for may ***not*** be there on the table. You may need to look for a synonym or similar phrase. Tables have headings; do students know about headings? Do they know that a particular symbol can be decoded by looking at the key? Do they know where to find the key?
- Identify another piece of information to find, and repeat the process. Stop periodically in the process, and solicit student input.
- Identify yet another piece of information to find, and let students talk the class through the process.

The next idea—portfolio assessment—includes a large dose of metacognition.

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Use Authentic Assessment Tools: Portfolios

Students in programs reflecting the real world will complete many authentic job-related tasks involving reading, writing, speaking, listening, calculation, computation, and critical thinking (e.g., problem solving and decision making). Dated artifacts of all these tasks—drafts, final versions, completed exercises, lab work, projects, performance tests, audio- or videotapes—can be kept in a *working folder* to provide a total record of the learner's work. When special pieces are selected from the folder and moved to another, special folder, then the learner has created a *portfolio*. Pieces can be selected for different reasons: to show representative work, to showcase best or favorite work, or to show progress, for example.

This information on portfolios was adapted from Sandra G. Pritz, Lois G. Harrington, et al., Assess Learner Performance (Columbus, OH: Center on Education and Training for Employment, 1997), pp. 25-27, 30.

Purposes

Having students maintain folders and portfolios is an excellent way to keep the focus on both process and product and to provide a basis for students to review and reflect on their progress as learners in reference to actual work rather than abstract, reductive scores and grades. Unlike material that is "done" once it has been graded, the working folder's contents belong to the learner and can be revisited at any time to be reworked using newly gained skills, increased competence, or fresh insights. This, too, reflects the real world. The portfolio, on the other hand, can serve as a permanent record of achievement.

Folders and portfolios provide a basis for students to review and reflect on their progress as learners in reference to actual work.

But portfolios aren't just a repository of already assessed things; this is an assessment process. The contents of the working folder are used to promote learners' reflection about and assessment of their own work and, perhaps, the work of their peers. Structured assessment activities can be devised related to the ***selection*** of materials for the portfolio. For example:

- Learners can be asked to review the material in their working folder and pick their favorite or best piece and describe, in writing, what they liked about it, what they learned from doing it, and why they consider it their "best" piece.
- Learners can select two analogous final products developed at different points in the program and compare them to identify indicators of progress.

We have our students prepare portfolios in place of a final exam. The students present their portfolios to a panel made up of teachers, parents, and business people.

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Groveport Madison
Freshman School

In each case, the written reflections and evaluations become a part of the portfolio, perhaps as a cover page to the documents assessed or in a separate portfolio log. If materials are judged by others (peers, instructor, others outside the program) as part of the selection process, those "judges" should provide narrative reviews as well, and these, too, should become part of the portfolio record.

These activities can be carried out individually, or students can collaborate as partners or in teams. Collaboration can be particularly helpful early in the program. A student might, for example, identify three favorite pieces and find it difficult to choose just one. A "second opinion" from a peer can provide additional insight and evaluative information that can help in making the final decision. Or, a supportive peer can help identify a "best" piece, with some admirable qualities, in the folder of a learner who's not sure anything there is of value.

Grady suggests other questions that can be used to structure students' reviews and assessments of the work in their folders. These were used originally in a writing class, but they could be easily adapted to other tasks:

- Look back over your work for this semester and discuss the strategies you used for creating it. Think about specific essays. Which were easy for you? Which were most difficult? What have you learned about your methods this semester?
- What do you like about your writing? What do you feel are your strengths? Be as specific as you can; cite essays if possible.
- What are you dissatisfied with in your writing? What areas do you feel need improvement?
- In what specific areas have you grown this semester?
- Discuss your target paper. Why did you choose it? What did you do to revise it to make it representative of your best work?[3]

3 E. Grady, *The Portfolio Approach to Assessment*, Fastback 341 (Bloomington, IN: Phi Delta Kappa Educational Foundation, 1992), pp. 24-25. (ED 356 273)

Structuring Portfolio Assessment

The word *structure* is very important in the use of portfolio assessment. No meaningful assessment of a potentially huge folder full of stuff can occur without it. The first step is to work collaboratively with the learners to answer some planning questions related to that structure. For example:

- ***Will materials from every area of instruction be saved or from just a few selected areas (e.g., written materials only)?*** This can be a crucial question, particularly if you or the learners are new to portfolio assessment. Those who have used the approach strongly recommend starting small. If different types of tasks will be documented, maintaining separate working folders for each may be most practical.
- ***What types of materials will be collected?*** Will the portfolio contain every scrap of paper generated or only certain things? If the latter, what will be the nature of those "things"? Will materials from outside class be included (e.g., lists of books read, budgets prepared)?
- ***How often will materials be selected for the portfolio?*** The selection process can be painstaking and difficult, so selection activities should not occur too often. Furthermore, although reflection on one's work can be extremely valuable and exciting, ***if overused*** it can become tedious; documenting the reflection process in writing can easily become a routine chore rather than a stimulating learning experience.
- ***What criteria will be used for moving the material from the working folders to the portfolios?*** For example, should the portfolio ultimately contain a representative sampling of materials from various points in the learner's progress (what is "best" at different times) or the overall best materials? The criteria chosen should, of course, reflect program objectives.

- ***What process will be used for moving the material from the working folders to the portfolios?*** For example, will the learner make the decision alone, or will peers or the instructor or even outside "judges" participate in the decision-making process? (But remember, if this is truly to be the learner's portfolio, the ***final*** decision should be left to the learner.) Will the selection be justified in narrative form by the learner, or will checklists be devised for learners to use in the selection process; for example, a checklist of criteria defining what "best" means? [4]

Guiding Students in the Decision-Making Process

Once such questions have been answered and a practical structure planned, implementing the approach should become much easier. To help provide the kind of initial guidance learners may need in ***coping*** with making decisions in the face of a folder loaded with material, one teacher has suggested the following procedure:

- Ask the class, "If you were going to put all your work together in a book, how would you organize it?"
- Guide them in brainstorming to identify the many organizational schemes possible (e.g., chronological, alphabetical, subject area, things loved and things hated, successful things and unsuccessful things).
- Then have students actually go through their material and organize it in some way. A great deal of dialogue will occur as they see observable progress—as they encounter things they struggled with once but now have mastered.
- Have them describe, in writing, the organization they chose.
- Once everything is organized, the assessment and selection process will generally seem less overwhelming.[5]

4 Fingeret, op. cit., p. 4.
5 Adapted from material by Melody Schneider cited in Fingeret, op. cit., p. 34.

Advantages

Like performance assessment, portfolio assessment is uniquely suited to the nature of integrated vocational-academic programs. It is learner-centered, focusing on the learner's own work and perceptions about it. All phases in the process—planning, implementation, and assessment—involve collaboration between the learners and the instructor and among the learners themselves. The materials used may involve the tasks the learner will need to perform in the workplace—authentic materials requiring the integrated use of basic skills. And often, development of the materials involves reflection and critical thinking. Perhaps the following best summarizes the value of this assessment approach—

> Teachers struggle with the relationship between their knowledge and judgments and those of their students during the process of assessing portfolios. There are questions about who sets the standards and who assesses the extent to which standards have been met.
>
> It should be remembered that this is not a standardized assessment process. You are not judging the extent to which students have met some predetermined standard set by outside experts in order to compare the work of your students with others' work. You and your students negotiate the standards in relation to the instructional goals and the curriculum, and you have to negotiate progress together as well.
>
> It is important to use your knowledge to help students learn to see their own progress and to give students the benefit of your experience and expertise. At the same time, it is important to learn about progress through the students' eyes, so that there is a richer overall understanding of learning and teaching in the end.[6]

It is important to learn about progress through the students' eyes, so that there is a richer overall understanding of learning and teaching in the end.

6 Fingeret, op. cit., p. 37.

One Example

Students could produce portfolios to document a project. Not only does this require students to apply skills from their various classes, it also provides a showcase of their work, which they could bring with them to job interviews.

- The vocational teacher introduces the project to students and explains what is to be included in the portfolio: photos documenting their work (both process and product); step-by-step instructions for how to carry out the work; and a cost sheet for the job.
- Students then select something they are working on in their occupational program for their project (developing a marketing proposal, devising an employee dress code, creating an inventory system, planning a menu for a banquet, etc.).
- Students begin to work on their projects, documenting their work in photos.
- The vocational teacher and applied communications teacher meet to discuss the projects selected.
- The applied communications teacher provides instruction in how to write clear, complete instructions. Students then begin to draft their instruction sheets in class, with teacher guidance. The completed instruction sheets are reviewed by both the applied communications teacher (for spelling, grammar, clarity, etc.) and the vocational teacher (for technical accuracy). The students then key their final drafts.
- The applied mathematics teacher can help students with the completion of the cost sheets.

Use Authentic Assessment Tools: Performance Assessments

Performance assessments should have the following three defining characteristics:

- Assessment tools derive from and focus on the ***competencies*** to be achieved. In applied academics classes, this would be the academic tasks described in the performance or enabling objectives (which should derive from the state standards).
- Assessment tools require actual ***performance*** of the task in a functional context (although factual knowledge may be tested separately, using paper-and-pencil methods, as a prerequisite to actual performance). Ideally, performance requires the integrated use of a number of related basic skills, as well as critical-thinking skills (e.g., problem solving and decision making).
- Performance is measured against established process/ product ***criteria***.

Devising the Problem Situation

The problem situation starts with an academic or vocational task selected for the program, preferably one related to the occupational context. For example:

Prepare a written report describing an equipment malfunction.

For the students to perform this task, however, they need more information. What equipment (e.g., computer, copier, cash register, kitchen range, pager)? What kind of malfunction? When did it occur? How often? In short, they need a description of the job-related problem situation: a *scenario*. Use of scenarios is also an extremely effective way of ensuring that assessment requires students to apply their full ***repertoire*** of basic skills in a functional context.

But, you say, I'm an academic teacher; what do I know about the job situation? Scenarios can come from a variety of sources:

- If you are familiar with the job situation, you can devise them yourself.

This information on performance assessments was adapted from Sandra G. Pritz, Lois G. Harrington, et al., Assess Learner Performance. (Columbus, OH: Center on Education and Training for Employment, 1997), pp. 17, 20-23.

- You can draw on the information base provided in the OCAP or ITAC to identify and devise problem scenarios.
- If you have a good relationship with students' occupational instructors, they can be tapped for the specific information you need to develop such scenarios.
- Students can develop scenarios—working alone, in small groups, or together with you as a total-class activity.

By involving the students, you can accomplish several very important purposes. Instruction becomes more student-centered, participatory, and collaborative. The problems described are those that actually constitute (or are perceived as) real problems for the students. In order to express those problem situations, the students must communicate: write or speak and listen. They may need to refer to written materials—to read—in order to provide all the facts of the scenario, and they will certainly need to read it once it's written.

Scenarios may also be called *case studies* or *case situations*. As defined by the Center on Education and Training for Employment for use in the development of competency-based learning guides—

- A ***case study*** describes a complete situation, including its solution. The student's job is to critique the process used and results obtained. What did the individual(s) described in the case study do right? What was done incorrectly? How could the process/results be improved?
- A ***case situation*** is open-ended. The problem situation is described, and it is up to the student to devise one or more appropriate solutions.

The situation should be as close as possible to the actual situation a worker might face on the job. The same materials and conditions should be provided.

As an example, consider how the task cited earlier—reporting an equipment malfunction—could be set up as a problem situation:

- Ask the students—as a whole class—to identify a problem involving an equipment malfunction they typically encounter in the vocational lab.
- Depending on the competency level of the students, either elicit the information required for the report, or make students responsible for specifying all the information they need.
- Guide the class in describing the situation orally, with students taking notes. If desired, summarize the descriptive information on a chalkboard or flip chart for future reference.
- Then have students individually develop equipment malfunction reports. If workers on the job would need to refer to equipment manuals or specifications or policy/procedure manuals in reporting the malfunction, then students should do so in the assessment situation as well.

Establishing the Performance Standards

One of the reasons objective test items (true/false, multiple-choice, etc.) have been so very popular is that they are, when well developed, ***objective*** rather than subjective. In other words, the answer is either right or wrong; the judgment of the evaluator is not, for the most part, required.

Grading an essay is harder because subjective judgment is involved. The trick is to ensure that professional judgment is tempered by established criteria defining the expected process and product standards. In applied academics and vocational programs, standards should come, at least in part, from the standards expected on the job. Criterion-referenced checklists can be used to evaluate performance objectively.

Criteria. Checklists can be developed to measure process, product, time factors, attitudes, or a ***combination*** of those elements.

- A ***product*** is something tangible, like a written report or a calculated budget. Sometimes measuring the product alone can tell you everything you need to know; the student could not have produced an acceptable product unless he or she followed the correct process.
- The ***process*** followed in performing the task should be evaluated if you want to track the steps the student performed. You may want to know, for example, whether all the words are spelled correctly in the student's written report because the student knew how to spell them—or did he or she use a dictionary, or did the computer's spell-checker do the job? Assessing process can also serve to ensure that the student doesn't short-circuit any critical steps in arriving at an acceptable product. Process will also be the focus in tasks without a tangible final product.
- Sometimes important ***time*** factors must be measured. If a worker notices an unsafe condition, for example, it may be crucial that he or she be able to communicate the facts of that situation immediately to coworkers and supervisory personnel.
- Often, ***attitudes*** are crucial on the job. The report must not only be written, it must be submitted on time and prepared with a concern for neatness and readability. Information must be communicated orally to coworkers and supervisors not just accurately but also professionally. To measure attitudes, you need to determine what ***behaviors*** would indicate their presence. For example, if the worker is "courteous" in dealing with customers, what does he/she ***do*** to demonstrate that courtesy (e.g., says please and thank you, acknowledges the customer's point of view as valid, volunteers to go the extra mile, maintains a pleasant facial expression)?

Rating scales. When you list the criteria together with a rating scale, you have a checklist. Various rating scales may be used; for example:

- yes / no
- not acceptable / acceptable / outstanding
- poor / fair / good / excellent
- 

Bear in mind that students may use checklists for self-assessment and, because they're students, may not be able to make fine distinctions concerning level of performance. Therefore, it's better not to devise a 7-point rating scale. Consider, too, that the simple yes/no rating scale has in its favor no emotionally freighted terms like "poor" and "not acceptable."

Checklist qualities. Each checklist should have the following important qualities:

- The checklist should be ***short*** enough to make it practical to use. Perhaps 5 to 10 items are sufficient for a simple skill, 10 to 20 items (at the most) for complex skills.
- The criteria included must be ***critical*** to successful performance of the skill. Minor or trivial criteria just make the assessment job more difficult and time-consuming.
- Each criterion should have some ***qualitative*** base. It is not enough to record that the student did something (e.g., *used capital letters*); he or she may have done it poorly or very well, and this needs to be shown (*capitalized the first word in each sentence and all proper nouns*).
- The items must be ***simple*** and ***unambiguous***—quickly read and understood by the students and the busy instructor.
- Items should be stated in ***parallel*** terms (e.g., all in the past tense).

To return once more to our example, the following process/product criteria might be appropriate for the task, *Prepare a written report describing an equipment malfunction:*

In preparing the written report, did you—

1. identify the equipment by serial number?
2. indicate the date and time of day (24-hour clock) when the malfunction occurred?
3. describe the exact nature of the malfunction (e.g., sounds made, visual cues, problems, effect on product)?
4. indicate, step by step, the actions you took in response to the malfunction?
5. identify any potential safety hazards involved?
6. suggest any possible causes for the malfunction based on observation or past experience?

Was the completed report—

7. brief and to the point?
8. clearly and simply stated?
9. neat and organized in a way that would be easy to read?
10. directed to the appropriate person or office for action?

When students complete performance tests, the process can also be videotaped so that the vocational teacher and one or more academic teachers can view it and grade it together.

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Applied Communications
Tolles Technical Center

Administering the Performance Test

The test should not be something you ***do to*** students. Students can be actively involved through self-assessment. (Ability to self-assess is a useful quality on the job.) In competency-based programs, for example, the learning guides are frequently designed so that students practice the given competency and assess their performance against established (explicit, not secret) criteria until they feel competent. It is then up to them to contact the instructor for "final" assessment—to say, "I'm ready."

Even on final performance, students can be involved in the rating process. Differences in student and instructor ratings provide a good starting place in the discussion that should follow assessment. By comparing and discussing rating differences, you can help the student become a more accurate self-assessor in the future.

And if performance is not successful, the student does ***not*** just get a grade and move on. Part of the follow-up discussion in that case would be to jointly devise additional learning activities to help the student gain the required competence. The student would then pursue those activities, practice, self-assess, and request instructor assessment once again. The student would continue to "recycle" until competence is reached. Clearly, it is important to present this as a natural ***learning process*** and not a ***test-fail-retest sequence***.

Student progress through the program, therefore, is not determined by grades earned on units that have been covered and left behind. Rather, it is measured by the ***number of objectives achieved***—the number of academic or vocational skills demonstrated successfully—as measured by the established or prescribed criteria.

Revisiting Skills

Critics of the competency/performance-based approach like to point out that just because a student performs well once, it doesn't mean he or she will be able to perform equally successfully 3 weeks from now. (These critics do not seem to notice that the same complaint could be justifiably leveled at traditional educational approaches: cram for the test, take the test, forget the material.) Nevertheless, the concern is a valid one. As students' skills build, you should provide test situations that require them to use (and assess) already-acquired skills as well as new ones—preferably in an integrated way. This not only ensures that the skills have really been "acquired," it also serves to reinforce those skills.

As students' skills build, you should provide test situations that require them to use (and assess) already-acquired skills as well as new ones--preferably in an integrated way.

Use Rubrics

It is crucial that learning goals are well articulated and performance standards are set before students engage in the tasks that will be assessed. Students find it difficult to perform at high levels when the criteria are unknown. One of the best tools for establishing and communicating clear standards on products and performances is the use of rubrics. A rubric is set of scoring guidelines—the standards for assigning scores to student work.

This information on rubrics was adapted from Dee Allenspach, Sandra Laurenson, Robin White, and C. Michael Loyd, Alternative Assessment: A Family and Consumer Sciences Teacher's Tool Kit (Columbus, OH: Vocational Instructional Materials Laboratory, 1996), p. 103.

Whereas a checklist gives a list of a items to be rated (e.g., The student incorporated verbal examples in the presentation) and then provides a simple rating scale (yes/no, none/fair/good/excellent) that applies to ***all*** items, a rubric provides specific descriptors for rating ***each*** item.

For example, to rate a student's vocal expression in making an oral presentation (one item) on a 1-5 scale, descriptors could be provided for levels 1, 3, and 5 as follows:

5 = Uses voice expressively; varies tone to add emphasis
3 = Controls vocal expression; uses some expressiveness and appropriate tone
1 = Voice is unexpressive or monotone

A rubric is a set of scoring guidelines, with specific descriptors provided for rating each item.

Advantages

A rubric provides teachers, as well students who are self-assessing, with more guidance in determining ratings—it helps make the assessment more objective. It also provides students with more specific information to use in improving their performance. In short, use of rubrics has the following advantages:

- Rubrics promote learning by offering ***clear, up-front performance targets*** to students, which allows them to see what mastery (and various degrees of mastery) of the task looks like. Students will know the basis for judging what constitutes exemplary/proficient, adequate/satisfactory/acceptable, or novice/beginner/amateur work before they begin.

- Presented to students along with the performance/ assessment task, rubrics provide students with ***"road signs"***—information about where they are in relation to where they need to be.
- Rubrics increase ***consistency*** in the rating of performances, products, skills, and understandings.
- Students are able to assess their own work based on ***specific standards/criteria*** and to "work up" to those standards.

Application of Rubrics

In her Hotel Operations & Hospitality program, Debra Moy uses the Family, Career & Community Leaders of America (FCCLA) rubrics for performance tests in the competency areas of laundry and linen folding, banquet setup, housekeeping, and table bussing/resetting. Usually, she "segments" each rubric to the cover only the smaller skill she's assessing, but on occasion she will have students complete the entire overall performance. Students then track their performance and progress in their applied mathematics class by charting their scores on line graphs. She has found that many students become more aware of their skills and progress when they see them portrayed visually on a graph.

A 1996 SREB publication,[7] describes the use of rubrics by English teachers at Delcastle Technical High School in Wilmington, Delaware. The teachers use a locally developed rubric to evaluate students' writing assignments. Each assignment is graded on a point system, with one to four points awarded for each category. An average point value of 3.5–4.0 means that a student's assignment meets standards; 2.5–3.4 means that it approaches standards; and 2.4 and below means that it fails to meet standards. Students and teachers refer to the analytic scale shown on the following pages in deciding what point value to assign.

7 Bottoms, Gene, and Sharpe, Deede. *Teaching for Understanding through Integration of Academic and Technical Education.* Atlanta, GA: Southern Regional Education Board, 1996, pp. 25-27.

Writing Rubric: Analytic Scale

Topic

4 The assigned topic is carefully developed and supported by many relevant details.

3 The writer provides some insight or depth of understanding to the assigned topic. He/she is mainly on topic, but more development of details is needed.

2 The development of the assigned topic is generalized and lifeless. For the most part, only generalities are provided. The writer may stray from the topic.

1 The writer communicates no real understanding of the assigned topic and appears to have given little thought to selecting details that would enhance development.

Organization

4 The response is organized and unified, with smooth transitions and a clear, logical progression of ideas. If the composition is multi-paragraph, it has an introduction, only one topic per body paragraph, and a closing.

3 The order of ideas is generally clear to the reader because the writer has tried to order his/her ideas. Some transitions may be used, but they don't always support the orderly flow of ideas. In a multi-paragraph assignment, the paper may lack an effective introduction or closing. It may also treat more than one topic per paragraph.

2 Although there may be some attempt to present ideas in an orderly way, the general impression is that the paper is confused and disorganized.

1 The paper has no discernible order of ideas.

Delcastle Technical
High School;
Wilmington, Delaware

Style

4 The writer demonstrates a quality of imagination and individuality that results in a distinctive way of expressing him- or herself. Where suitable, the writer states what he/she really thinks and feels.

3 The writer may include some personal details and comments where suitable but also uses generalizations or value language at times. While the paper may be correct, it lacks a consistent expression of style.

2 The writer rarely uses personal details or comments. The style seems bland, guarded, flat, and not very interesting.

1 The writer demonstrates no recognizable individualistic style.

Word Choice

4 Words are specific and used accurately in a thoughtful, imaginative, and vivid way. Clichés and "a lot" are avoided. Similes, metaphors, and other figurative language may be used.

3 Some words are specific, thoughtful, imaginative, and vivid.

2 Common, stale words are used in the same old way. The repetition of words and phrases distracts the reader.

1 Word choice is limited and immature. Sometimes the word choice is inappropriate.

Sentences

4 The sentences are varied in length and structure, showing a control of sentence structure. The paper reads smoothly from sentence to sentence. Run-on sentences or sentence fragments are avoided. Correct punctuation makes sentences clear and easy to understand.

3 The writer shows some control of sentence structure and only occasionally writes a sentence that is awkward or puzzling. Most sentences are punctuated correctly.

2 The writer has definite problems with sentence structure. Some sentences are short and simple in structure or childlike and repetitious in their patterns. Sentence formation errors may be present.

1 There is almost no evidence that the writer has a command of English sentence structure.

Conventions

4 There are no obvious errors in spelling, punctuation, capitalization, and usage (verbs, pronouns, homonyms, etc.). The writer shows that he/she is familiar with the standards of edited written English.

3 A few errors in spelling, punctuation, capitalization, and usage appear in the paper, suggesting that the writer has not been consistent in using standard forms. Errors do not substantially detract from the overall effectiveness of the paper.

2 Errors in spelling, punctuation, capitalization, and usage are so numerous that they are distracting to the reader.

1 Errors in standard written English are serious and frequent enough to interfere with meaning.

Use Periodicals

Occupation-specific or general career magazines and local, regional, or national newspapers can provide a rich source of classroom activities.

Sources of Materials

The following are just a few of the types of sources you might consider for use in your classes:

- Do your students belong to a vocational student organization? If so, they probably receive copies of the organization's journals. For example:

  Business Professionals of America
  Phone: 614-895-7277; Fax: 614-895-1165
  E-mail: <bpa@ix.netcom.com>
  Website: <http://www.bpa.org>

  DECA: An Association of Marketing Students
  Phone: 703-860-5000; Fax: 703-860-4013
  E-mail: <decainc@aol.com>
  Website: <http://www.deca.org>

  Future Business Leaders of America–Phi Beta Lambda, Inc. (FBLA-PBL)
  Phone: 800-325-2946; Fax: 703-758-0749
  E-mail: <general@fbla.org>
  Website: <http://www.fbla-pbl.org>

  Family, Career & Community Leaders of America (FCCLA)
  Affiliate of FHA/HERO
  Phone: 800-234-4425; Fax: 703-860-2713
  Information Hotline: 800-636-8646
  E-mail: <natlhdqtrs@fhahero.org>
  Website: <http://www.fhahero.org>

  SkillsUSA–VICA
  Phone: 703-777-8810; Fax: 703-777-8999
  E-mail: <anyinfo@vica.org>
  Website: <http://www.vica.org>

Occupation-specific or general magazines and newspapers can provide a rich source of classroom activities. The types of activities they support are limitless.

- What about industry associations? Many of these provide its members with magazines and newsletters. For example:

  American Management Association International
  Website: <http://www.amanet.org>

  American Hotel & Motel Association (AH&MA)
  Phone: 202-289-3100; Fax: 202-289-3199
  E-mail: <infoctr@ahma.com>
  Website: <http://www.ahma.com>

  International Association of Administrative Professionals (IAAP)
  (formerly Professional Secretaries International)
  Phone: 816-891-6600; Fax: 816-891-9118
  E-mail: <service@iaap-hq.org>
  Website: <http://www.iaap-hq.org>

  American Culinary Federation, Inc.
  Phone: 904-824-4468; Fax: 904-825-4758
  E-mail: <acf@aug.com>
  Website: <http://www.acfchefs.org>

  International Association of Culinary Professionals
  Website: <http://iacp-online.org>

- Do (or could) your students subscribe to a career-focused magazine such as *American Careers*? Career-related articles and statistics provide a natural jumping-off place for a wide range of classroom activities. Furthermore, magazines developed specifically for classroom use generally come with a teacher's guide detailing creative ways of using the articles in each issue.

  American Careers, Career Communications, Inc.
  Phone: 800-669-7795; Fax: 913-362-4864
  E-mail: <ccinfo@carcom.com>
  Website: <http://www.carcom.com>

- Many newspapers provide classroom sets of their papers for a limited time period, either free of charge or at a discounted rate. Some major papers (e.g., those in large cities, *USA TODAY*) also provide teaching guides to support use of the materials.

  USA TODAY
  Phone: 800-757 TEACH

- You may be able to arrange to have your branch of the U.S. Postal Service keep undeliverable magazines for you to pick up periodically.
- And don't forget the Internet. A number of magazines, newspapers, and news networks offer relevant online features and articles. For example:

  Balance Sheet
  Website: <http://www.swep.com/bused/news>

  BusinessWeek Online
  Website: <http://www.businessweek.com>

  Business Wire
  Website: <http://www.businesswire.com>

  CNN Financial Network
  Website: <http://www.cnnfn.com>

  Euromoney Online
  Website: <http://www.emwl.com>

  Money.com
  Website: <http://www.pathfinder.com/money>

  The New York Times
  Website: <http://www.nytimes.com>

  The Small Business Journal
  Website: <http://www.tsbj.com>

  USA Today
  Website: <http://www.usatoday.com>

  The Wall Street Journal Interactive Edition
  Website: <http://update.wsj.com>

  The Washington Post
  Website: <http://www.washingtonpost.com>

These are high-interest materials containing relevant, real-world information, and the types of activities they support are limitless.

Classroom Applications

An ***applied communications*** teacher could use activities such as the following:

- Have students read an article or editorial on a controversial subject and then participate in a class or panel discussion or debate. Discuss fact versus opinion and loaded language.
- Teach (or review) how newspapers are typically structured and laid out, and then ask students to locate specific articles or types of information in the paper. For some classes, making this a competition will add motivation.
- Teach how newspaper articles are typically structured (e.g., using the inverted pyramid structure; answering the 5 W's in the lead paragraph). Then have students complete activities related to that structure, such as answering the 5 W questions for given articles.
- Have students identify a job they'd like or a car they'd like to own and then find out facts and figures related to that choice using the classified section of the newspaper. Have them pick the three jobs/cars advertised that seem to be most desirable and explain the criteria used in making their decision.
- Ask each student to skim the newspaper headlines (or journal article titles) and pick an article of interest to read and report on orally to the class. Have students take notes and briefly outline their presentations before making them. To minimize duplication, divide the class into smaller groups, and give each group one section of the newspaper to pick from.
- Students could each be assigned an article to skim and asked to circle each unfamiliar word. They could then use prefixes, suffixes, roots, context, etc., to try to define the words. Through class discussion, the words could be shared and tentative definitions could be improved.

An ***applied mathematics*** teacher can make very effective use of the charts and tables and statistics found in most newspapers and many journals, such as sports statistics, stock market data, and top 10 movies.

- Have students read and interpret the data provided.
- Give students scenarios or problems and ask them to use the data in responding to the scenario or solving the problem.
- Assign long-term projects as well. For example, have students build a database of statistics over time for a specific sports team or select a stock to "buy" and then follow and chart its progress.

An ***applied science*** teacher can find ideas for activities in articles or business sections featuring new technology, particularly that related to students' occupational area(s). The weather page is another natural resource. One activity from a *USA TODAY* teaching plan relates to an article entitled, "Life May Have Once Existed on Mars." Students are asked (1) to imagine that people living on Mars millions of years ago are looking through a high-powered telescope pointed at Earth and (2) to describe what those people might see. (This could easily be a joint English-science assignment, with the science teacher grading the papers for scientific content, and the English teacher grading them for organization, style, sentence structure, and adherence to conventions.)

We do a stock market project in which students follow and graph their selected stocks for 6 months. We make a contest out of this, with a prize for the winner.

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Simulate the Workplace

Some students come late to class. They skip school. They turn in homework late or not at all. Assignments that are turned in are carelessly done, sloppy, and incomplete. They treat the teacher—and each other—with little respect. So what? they say; it's only school.

Many teachers have found that when they turn the classroom into a workplace and treat their students as workers, there is great improvement in both attitude and performance.

In Instruction

For Thomas Grandy, an applied communications teacher at Ashland-County West Holmes Career Center whose students were in Business programs, this meant turning his classroom into a simulated business: ComQuest: A Communications Catalyst. Students were employees of this company; Grandy was the CEO.

Many teachers have found that when they turn the classroom into a workplace and treat their students as workers, there is a great improvement in both attitude and performance.

Classes were run like business meetings, with activities centered around fictional companies or lab experiences (and a strong focus on the SCANS competencies). For example, there were discussions on work relationships and professional issues. To reflect the real world of work in which time is limited, students were required to keep the discussion focused; at the end of the activity, they had to write a synopsis.

Students were also asked to do magazine research of career-specific topics. Other activities included business correspondence, telephone etiquette activities and role play, customer relations study and role play, and teamwork activities (e.g., "human knot," in which a circle of students hold hands in a tangled way and must communicate to get untangled).

When businesses sell products, a technical writer must develop instructions for their use. Thus, Grandy's activities also involved writing effective instructions. In one activity, he had students bring in a collection of tools from their lab and work in teams of four to write a set of instructions for each tool. In another activity, he provided a strange collection of kitchen tools and antique tools. Groups of four then had to identify the real—or imagined—purpose of a selected tool and write a set of instructions for its safe use.

On the job, you're paid by the products developed, by the time on task. Thus, Grandy had students keep logs of their activities in lab for one week. The logs were then used as a basis for lessons on effective time management.

As more technology has become available, the activities in his classes have become more sophisticated. Students now participate in an international business study, conducted online with Russian students. They use real customers in some of the projects, which provides opportunities for real-world experience in effective communication. Grandy finds that the feedback students receive from customers concerning their performance has a great deal more credibility (and is more likely to result in improvement) than that provided by the teacher.

ComQuest's Website can be found at <http://www.tccsa.ohio.gov/dp/awhj>. The CEO can be reached by e-mail at <awhj_grandy@tccsa.ohio.gov>.

Students in Debra Moy's Hotel Operations & Hospitality program clock in and out daily using a time clock located in the vocational lab. At the end of the week, they take their time cards to mathematics class where they compute hours and "pay" (based on industry entry-level wages). They are given "raises" based on grades in ***all*** classes and "bonuses" based on outstanding performance in ***any*** class. Students open "checking accounts" and deposit their weekly "paychecks." Before Winter Break, there is an auction with lots of donated items, and students can bid on items using the "money" in their "checking accounts."

Furthermore, full-blown simulations are often a standard part of business and management programs—whole textbooks are built around an extended simulation. The South-Western Educational Publishing catalog, for example, offers a wide range of automated and manual simulations such as the following:

- *Office Filing Procedures Envelope Simulation*
- *Dallas Oil, Inc.: An Administrative Secretary Simulation*
- *The Winning Streak: A Marketing Decision-Making Simulation*
- *The Stock Market: A Computer Simulation*

If vocational and academic teachers are working as an integrated team, these simulations could easily extend across classes, with each of the academic teachers using the workplace context of the simulation to introduce and reinforce academic concepts.

In Assessment

Another truth about the real world of work is that when a worker hands in unacceptable work, he or she doesn't get a grade and another assignment. In most cases, the work is handed back to be made right. Thus, you can also simulate the workplace in your assessment practices.

According to Ted Panitz <tpanitz@mecn.mass.edu>

> I use a mastery approach to testing where I check mathematics exams for correct answers and return the papers for corrections during the exam. I do not give partial credit at this point; I simply circle the problems that are not correct. The passing grade is 80% after the corrections are completed and if students obtain the 80% I then keep returning the tests until the student has 100% correct answers. The emphasis is on understanding the problem, not the grade, and all students become capable of obtaining a perfect test.

The effect of this approach is to empower the students, create a positive assessment atmosphere, and encourage students to take more responsibility for their learning and success. This approach encourages students to keep trying problem solutions until they figure out how to solve a problem. It helps them get past the problem of making silly mistakes that imply they do not understand a concept because they did not get the exact right answer. It demands that they keep thinking about a solution until they resolve in their minds how to complete it.[8]

Through Media

Another way to bring the world of work into the classroom is to videotape it. A teaching team from Ohio Hi-Point Career Center (Bellefontaine, Ohio) set out to produce a simple video presentation for students in one vocational program on why academic skills are so critical in the world of work. The video would show owners and managers of related businesses explaining the mathematics and communications skills required on the job—the skills they look for when hiring (or promoting) workers.

But this was a team project that just grew and grew:

- They consulted the school's media specialist and decided to produce an interactive CD instead. Using CD technology would provide for user interaction and more versatility.
- When the team members learned how much data could be stored on one disc and how easy it would be to sort and access the data, they decided to cover ***all*** related programs in the career cluster in the presentation. They also decided to cover not only the retail side of the business, but also the supply side and the manufacturing side.
- Instead of just interviews (talking heads), plans now call for reinforcing interview comments by showing employees actually using those academic skills on the job whenever possible. Alternatively, footage can be taken of vocational students applying those skills in the vocational labs.

8 Panitz, Ted. "How Do You Communicate High Expectations to Your Students in Order to Encourage Their Success?" *School-To-Work News* (July/August 1996): 5.

- Initially, the team members planned to do most of the taping themselves, but on further thought, they decided to use students to do the interviews and produce the CD presentation. The media specialist is helping students learn how to transfer material to CD. Students in graphic arts classes are developing graphics for the CD. Students in applied communications classes are working on interview techniques.

Because students seem to pay far more attention to the owners and supervisors of the companies in which they hope to work, the team hopes that using this CD in future classes will help provide some much-needed motivation for students to master academics.

Incorporate Projects

Projects can be a wonderful kind of hands-on activity when they involve creativity and teamwork and problem solving. They also allow many opportunities to build communication skills. Projects tend to be multidisciplinary, even when conducted within a single course. For example, the marketing proposal projects described later in this section involve knowledge of the occupation, oral presentation skill, mathematical calculations, and a written product. However, projects can also be the focus of instruction in two or more courses. The following is a sampling of approaches and projects you might want to incorporate into your instruction.

Projects can involve creativity, teamwork, problem solving, and opportunities to build communication skills.

One caution should be mentioned here: Keep it fresh! When a perfectly good project is used year after year, it can lose its effectiveness. Assume, for example, that an applied communications teacher has a class track down all the safety hazards in the school facility and develop a brochure on school safety to be shared schoolwide. Great activity—authentic, with an actual, useful application. But if that teacher tries the same project with next year's class, it's just busywork. The class members know the task has already been done; they have copies of last year's brochure in their possession. It's time for a new project.

Rube Goldberg Approach

With this approach, students invent an extremely complicated—and usually silly—device that uses a series of mechanical actions to complete a very simple task such as setting off a mousetrap. It works like this:

- You (or students) bring in a variety of household items (often trash, like cardboard paper-towel tubes).
- Small groups of students are asked to pick a problem (e.g., bursting a balloon) and use the available items to design, build, and demonstrate a device that will solve it. You may specify the criteria to be met (e.g., the device must have a minimum of five mechanical actions and reactions).

- Once the projects are completed, students present their devices. They can be evaluated not only on the quality of their projects but also on the effectiveness of their presentation skills. By videotaping these presentations, you can build a library of examples that can be enjoyed by students in the future.

LEGO® Project

Thomas Grandy, applied communications teacher at Ashland-County West Holmes Career Center, has students build something using LEGO® blocks and write up specific instructions for how the structure was built. The structure is then taken apart, and the LEGO® blocks and the instructions are placed in a plastic bag. Students trade plastic bags, and each student tries to recreate the original structure using the instructions. If the instructions are not adequate, they are returned to the author for revision.

Canterbury Tales with Online Glossary
<http://www.librarius.com>

Chaucer Projects

Darla Boram, applied communications teacher at Upper Valley JVS, approaches the study of Chaucer from a project point of view. She starts with a unit on mythology to help unlock some of the allusions in the work. She interweaves information on the Middle Ages, talking about things with high student appeal, like chivalry, and bringing in lots of high-interest books on castles and such. Since the language of the original *Canterbury Tales* is, in essence, a foreign language, she uses a translation that is easy for students to understand, while maintaining the rhythmic quality of the original. Classroom instruction focuses on just the Prologue and a few of the tales. And the culminating project? Students develop a book of their own *American Tales*—written in iambic pentameter. Secretarial and data processing students key the book; graphic arts students bind the books. A book cover design contest can also be part of the project.

For students in business and management areas, a *Canterbury Tales* unit could easily involve other occupation-related activities that cross classroom boundaries. The pilgrimage is a tour, with clear opportunities for activities related to travel and tourism, hospitality, and marketing. Students could prepare itineraries for the tour (with key sights to see along the way, lodging, meals). They could develop written materials or oral presentations (perhaps enhanced using presentation software such as PowerPoint) to promote the tour package.

Perhaps, students in hotel operations could develop a plan for turning a medieval castle into a bed & breakfast. Imagination and creativity (and humor) could run free here—what amenities do you offer and promote when there's no central heating, no hot and cold running water? They could work with business students to prepare operational budgets.

Students in culinary arts could research foods typically eaten, as well as cooking methods, during medieval times. They could then develop a menu for a medieval banquet.

In applied mathematics classes, students could research currency and costs in medieval Britain and cost out the tour package and/or bed & breakfast rates. In applied science, they could consider health issues in medieval times. What illnesses and diseases would the pilgrims have had to worry about, how would they have been treated, and with what general results?

Medieval Britain (and Castles)
<http://britannia.com/history/h60.html>

Marketing Proposal Projects

In their presentation at the 1996 All-Ohio Conference, Mary Helen Steinauer and Kathy Freeman from Great Oaks Institute of Technology and Career Development shared a description of the Carpentry Presentation Project. This project could easily be adapted to business and management. For example:

Divide the class into "marketing firms," and ask each firm to develop a proposal for promoting a new restaurant. Tell them the restaurant's promotional budget for this activity is $5,000 maximum. Have each firm develop a complete marketing proposal, which must include the following:

- Written description of the proposed project (using technical writing)
- Examples of proposed materials and/or similar materials prepared for other clients (e.g., brochures, ad campaigns)
- Detailed estimate of the proposal
- Estimated date of completion
- Oral presentation concerning the proposed promotional plan
- Visual aid(s) to help persuade the "client" to choose the company's proposal
- List of anticipated questions

Once the written proposals and presentation plans are complete, ask students to sell their proposals to the client. Select a panel of several adults (e.g., culinary arts teachers, local restaurant owners) to role-play the restaurant representatives. The panel then judges each presentation and selects the firm to be hired. The winning firm receives 20 extra-credit points.

Caryn Jackson, a mathematics/science teacher at Tolles Technical Center, suggests that another effective proposal development project could focus on the provision of a stress management training program for employees at an imaginary company. Development of the proposal would require skills from multiple disciplines. Students would need to research stress, its physiological and psychological effects, and stress management techniques; determine costs for conducting the training program (personnel, time, facilities, materials); do cost-benefit analyses; and develop an effective written proposal as well as materials to promote the program.

"Best Place to Live" Project

A long-term project at Canton High School and Canton Career Center in Mississippi was described as follows:

> Students searched for the best U.S. city and region in which to live. Teachers from the academic areas of English, algebra, physics, and social studies worked with vocational teachers to plan the project. For each city selected, the students obtained information on size and population, architecture, racial makeup, living conditions, and regional technology.
>
> Students were evaluated on data collection and analysis; use of communication skills in designing a questionnaire and writing cover letters to obtain information; design and organization of a scrapbook of data and articles on the cities; an oral presentation on research findings; design and construction of a plywood map showing cities and regions; and decision-making skills.[9]

9 "Progress Reports: HSTW Sites Share Integration Activities." *Integrated Learning* (January 1996): 12.

Career Magazine Project

Development of a career magazine can also be an effective multi-course project. Students can work in applied communications classes to research jobs within their occupational area. They can work with the applied science teacher to identify and learn about new technology related to the field—another source of articles for their magazine. In applied mathematics classes, they can summarize data related to the field (e.g., percent of growth in each job over the last 10 years) and develop charts and graphs to present that data.

Mall Development Project

Tolles Technical Center Teaching Team
Lorre Hedrick, Marketing
Caryn H. Jackson, Mathematics/Science
Kimberly Tavenner, Applied Communications

In this marketing project, teams of students develop plans for a new mall, which includes application of marketing, communication, and mathematics skills, as well as the use of teamwork and decision-making skills. Students start with research on malls, with guidelines of what to look for provided by the marketing teacher. Through visits or phone calls to local malls and library research, they determine typical mall characteristics (square footage, number of stores, anchor stores, mall office facilities, customer services, availability of restrooms and phones, food establishments, traffic patterns, storage, entrances and exits, etc.).

Students then spend ten marketing class periods (and homework time) developing plans for all aspects of their new malls. Where will the mall be located, and why? What will it be named? What anchor stores and specialty stores will the mall have? How many total stores? What will be the square footage of each store (and will the total square footage fit in the selected location)? What extras will they provide (e.g., a skating rink, babysitting services)? What evidence is there that people in the area where the mall will be located will patronize the types of stores selected?

The mathematics teacher can work with students on calculating square footage and preparing "blueprints" of their malls to scale. He or she can also help them in considering the variables that affect how you determine what rent to charge per square foot.

When the plans are completed, each team of "developers" must present its plan to the potential "investors" (the other members of the class). Investors critique each plan: Is it realistic, appealing, well-presented?

This is a project that could be built on throughout the year. Students could use the facts about their malls as a basis in carrying out activities related to other content in the marketing program (e.g., advertising, human relations).

Victorian Banquet Project

Scarlet Oaks Career Development Campus Teaching Team

Patricia Andrews, English/Technical Communication

Debra Moy, Hotel Operations and Hospitality

The theme for the 1998 School Board Dinner at Scarlet Oaks was the Victorian Era (1860-1910), and students in various programs were responsible for planning and executing the banquet setup, decorations, exhibits, and meal for 180 people. This was a major project across program areas, with culture, art, and architecture also incorporated into the activities.

- Hospitality & Facility Care: The instructor preselected Victorian inns throughout the U.S. and sent for brochures and rate sheets to use as backup. In class, lessons were provided on inns, market segmentation, and introduction to the Victorian theme. Students compared rates, amenities, and locations of various inns in preparation for developing individual displays on Victorian inns throughout the U.S.
- Technical Communications: Students located Websites for each inn, wrote letters to the inns requesting information, and developed displayable fact sheets and display brochures.
- Social Studies: Students discussed transportation, infrastructure, and architecture of the Victorian era and marked the location of each inn on a U.S. map for display.
- Applied Math: Students used road maps to determine routing from home to inn and calculated mileage and travel times.
- Child Learning: Students researched schooling/education in the Victorian era and prepared a display of their findings. They also made ornaments and table centerpieces and decorated a Christmas tree for the banquet.
- Applied Science: Students researched inventions of the era and prepared a display of their findings.

- Baking/Culinary Arts: Students researched Victorian recipes, created a menu, and prepared and served the food at the banquet.
- Applied Science: Students made hand-made gramophones. They also prepared a display featuring a nutrition pyramid of the foods served at the banquet.
- Applied Math: Students calculated costs for the banquet. They also did recipe conversions—converting huge banquet-sized recipes into recipes for family-sized servings to be shared as handouts at the dinner.
- Hotel Operations: Students were responsible for banquet setup and for developing individual displays on Victorian Inns throughout the U.S.
- CQI: Seniors researched, collected, and displayed products from the Victorian era and produced a storyboard and time line.
- Carpentry: Students made wooden toys typical of the period (e.g., rocking horse, blocks, wagon).
- Construction Electricity: Students did the lighting for the banquet.
- Art & Printing: Students produced the banquet programs.
- Law Enforcement: Students provided security for the banquet.
- NJROTC: Students served as greeters at the banquet.
- Technical Communications/English: Students in all programs read two stories from the Victorian era: *A Christmas Carol and Triangle Fire.*
- American Government/Employability: All students studied the Industrial Age, including immigration, labor and labor unions, and child labor laws.
- Hotel/Hospitality Field Trip: Students went by train to Lebanon, Ohio, to tour the Golden Lamb Inn and the town.

One recommendation related to the display work was that students needed models to guide their work. After the work was already in progress, teachers prepared templates for computer work and a model display for students to refer to.

Victorian Tea Party

An Internet site offers a related project in which each student in English class researches a specific British author from the Victorian era and then attends a tea in the role of his or her chosen author. The tea is hosted by Queen Victoria (the English teacher, of course!). This could be a wonderful joint project for English and culinary arts classes. In the specific example described on the Website, the home economics teacher was involved in providing the tea and "sweets," as well as instruction on proper tea etiquette.

Victorian Tea Party
<http://www3/sympatico.ca/ray.saitz/victea.txt>

Use Demonstrations and Discovery

Science and mathematics lend themselves very nicely to the discovery—or inquiry—method. Instead of presenting a formula or scientific principle to students and then moving on to application, start with the application and let students try to deduce the formula or principle themselves.

Many books are filled with demonstrations and experiments that can be used in this way (some are listed in the fifth section of this document). The best demonstrations/experiments are those that present the principle in relation to the students' occupational area. But regardless of the content, it is critical that the activity move beyond simple fun to the discovery of the underlying principle. You may get students' attention when you perform what looks like (and may in fact be) a dangerous task, but their attention is worth little if learning does not occur. An ideal way to ensure that the principle has been learned is to follow up the first demonstration/experiment with a completely different one in which the same principle applies.

It is critical that the activity move beyond simple fun to the discovery of the underlying principle.

Demonstrating a Science Principle

To teach the characteristics of nonutonian fluids, one applied science teacher used a cornstarch and water mixture. The mixture increases in viscosity the faster you move it. If you slowly insert and remove your finger, the mixture acts like a liquid. If you jab it quickly, the mixture resists penetration like rubber. If you try to pull your finger out quickly, the mixture grabs the finger and hangs on.

Likewise, if you want students to understand the importance to human beings of having clean air in their work environment, why not set up a demonstration that shows the effects of different air quality (e.g., clean air and air from a "sick" building) on living plants?

I find my students react very well to a demonstration/discovery approach. Their interest and motivation are already peaked before we hit the "paper" work, and they have already begun using vocabulary related to the concept before encountering it in a textbook setting.

Caryn H. Jackson
Mathematics/Science
Tolles Technical Center

Currency Converter
<http://www.oanda.com/converter/classic?user=pathfinder2>

Demonstrating Math Skills and Principles

An applied mathematics teacher at EHOVE Career Center has students learn volume calculation by using the sidewalks outside the building. He starts with some background work in volume calculation and then takes them outside to tackle the sidewalks, some of which have curved edges. They work in groups to measure the sidewalks and work up an estimate of the concrete needed if the sidewalks had to be replaced. Students are told to assume a 4"-thick sidewalk and a cost of $50/cubic yard. He also has them sketch the sidewalk and label the dimensions. Their calculations must be accurate to the nearest 1/4 cubic yard.

Business students could identify tools of their trade (e.g., desk items such as correction fluid, pens, pencils, staple removers) that need to be organized for ease of use (needs assessment) and then design a creative and innovative product for that purpose (not just the same old desk organizer). They would need to determine the dimensions and structure of the organizer based on the specific set of tools identified. (This activity could easily become a schoolwide project. Drafting students could develop a polished design for the organizer; woodworking and/or sheet metal students could produce it; marketing students could develop a marketing plan for it. And the organizers—perhaps complete with a school logo—could be sold in the school store.)

When teaching proportions, Ryan Wright, applied mathematics teacher at Knox County Career Center, has students calculate how many Canadian dollars they would get for U.S. dollars using current money exchange rates.

Use Planning Tools That Support Integration

When you are building your unit and lesson plans, it is very easy to get caught up in the subject you love best—the one in which you are certified to teach—and to forget about integrating material from other classes into your plans. The planning checklist that follows can help you focus on ***integration*** in your plans by reminding you of all the categories to consider, all the intersections possible. Since instructional ***variety*** is one of the keys to lesson success, this form also reminds you to look at—and use—the many instructional/assessment strategies and resources available to you.

Integration Planning Checklist

Lesson Topic: _____

For each of the following five focus areas, check all responses that apply.

Skills/concepts from which of the following areas can be presented/reinforced in this lesson?

- ☐ Applied Communications
- ☐ Applied Mathematics
- ☐ Applied Science
- ☐ Technology Literacy
- ☐ Employability Skills
- ☐ Teamwork
- ☐ Professionalism
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

- ☐ Administrative/Office Technology
- ☐ Computer Information Systems
- ☐ Accounting
- ☐ Business Administration & Management
- ☐ General Marketing
- ☐ Entertainment Marketing
- ☐ Marketing Management
- ☐ Distribution & Warehousing
- ☐ Travel & Tourism
- ☐ Hotels & Resorts
- ☐ Culinary Arts & Food Service Management
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Applicable Instructional Strategies/Activities:

- ☐ Demonstrations
- ☐ Lectures/Illustrated Talks
- ☐ Projects
- ☐ Portfolios
- ☐ Scenarios
- ☐ Case Studies
- ☐ Workplace Simulations
- ☐ Thinking Strategies (Metacognition)
- ☐ Problem Solving
- ☐ Decision Making
- ☐ Discussion
- ☐ Brainstorming/Buzz Groups
- ☐ Discovery Method
- ☐ Role-Playing
- ☐ Team Teaching
- ☐ Field Trips
- ☐ Guest Speakers
- ☐ Mentoring
- ☐ Teamwork
- ☐ Computer-Aided Instruction
- ☐ Interviews/Surveys
- ☐ Community-Based Activities
- ☐ Research/Independent Study
- ☐ Laboratory Activities
- ☐ Drill/Practice
- ☐ Games
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Applicable Instructional Resources:

- ☐ Vocational Texts
- ☐ Applied Academics Texts
- ☐ Authentic Materials
- ☐ Journals
- ☐ Newspapers
- ☐ Word Processing Software
- ☐ Communications Software
- ☐ Internet
- ☐ CD-ROM
- ☐ Videotapes
- ☐ Audiotapes
- ☐ Films
- ☐ Overhead Transparencies
- ☐ Handouts
- ☐ Models
- ☐ Real Objects
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Applicable Assessment Strategies:

- ☐ Objective Test Items (e.g., multiple-choice, true/false)
- ☐ Open-Ended Test Items (e.g., essay, short answer, oral)
- ☐ Performance Assessment
- ☐ Performance Checklists
- ☐ Rubrics
- ☐ Portfolio Assessment
- ☐ _____
- ☐ _____

Assessors To Be Used:

- ☐ Vocational/Tech Prep Teacher
- ☐ Applied Communications Teacher
- ☐ Applied Mathematics Teacher
- ☐ Applied Science Teacher
- ☐ Student (self-assessment)
- ☐ Peers
- ☐ Representatives from Business, Industry, and Labor
- ☐ _____
- ☐ _____

Devise Joint Plans with Other Teachers

Teaching teams contributing to the Ideabooks spent time developing lesson plans tying the world of the classroom to the world of work. Some of these plans involved blending authentic experiences into the applied academics classes. Some involved joint activities between the vocational teacher and one or more academic teachers.

On the following pages, you will find a sample planning format, a blank form, and examples of the plans that were produced.

According to a report prepared by Brett Dickey for a teaching team from EHOVE Career Center (Milan, Ohio)—

> The greatest obstacle to the integrated lessons came from the students. They are very much indoctrinated into the system of having their subject matter divided into very distinct units of time. It took them some time to get used to the idea that they were to work on the same project in more than one of their classes. It was not unusual to hear them complaining, saying things like, "Why do we have to do that now? That's what we worked on in math today" or "That's for welding class, not communications class." However, once they adapted to the idea that their work in three classes was to center around a single project, the work improved, and complaints were heard less often. Some students even said that they wished more of what they were taught were presented in this format.
>
> One of the strengths of the integrated lessons was the constant reinforcement and feedback that students received. The teachers were able to communicate more effectively with the students since they were aware of what was going on in the other classes. This served to keep students on task since everything they did centered around one project.

Hint: To be able to share your plans with others, you need to provide sufficient detail so that it will make sense to someone else. If another teacher cannot replicate the lesson because you have failed to include full explanations or complete information, the plan is not helpful.

In reporting their integration efforts at Scarlet Oaks Career Development Campus, Debra Moy and Patricia Andrews indicated that they developed their plans working with their total cluster "team," including culinary arts, child learning, hotel operations, science, social studies, and English/technical communication instructors. They spent 2 days initially during the summer designing projects to be used in their cluster groups. From those designs, they came up with several themes to use for integrated projects during the coming year.

Once they returned to school, the cluster team continued to meet twice weekly after school to discuss the collaborative theme projects and to divide responsibilities for collecting materials and making needed arrangements. Scheduling was a real challenge since several of the teachers worked with more than one vocational cluster. In fact, the main weakness identified was the lack of shared planning time (except on their own time). Since their classrooms were quite a distance apart, lessons could not be discussed without set meeting times, which meant long after-school hours for everyone involved.

According to the team, however, an interesting offshoot of this time together was that they always came up with many more great ideas than they could possibly put to use—***each idea seemed to lead to at least two more!***

Students also seemed to enjoy working on the integrated activities. Scarlet Oaks is a frequent stop on tours by academic, business, political, and community visitors, so students were frequently asked for their opinions about the clustering concept. For the most part, their responses were quite positive. Previously, academic instructors had often been "visitors" in students' vocational labs. Through the collaborative lessons, however, students indicated that they better understood the part that mathematics, science, and English skills play in the real world. Furthermore, the academic teachers involved have reported a better understanding of students' strengths and individuals needs when in a work setting.

Sample Format

In the sample format shown below, italics indicate the directions for completing each section.

Occupational Area: *e.g., Administrative/Office Technology, General Marketing, Computer Information Systems, Hospitality Services, Culinary Arts*

Academic Area: *e.g., Applied Communications or Mathematics or Science*

Activity Topic / Skill Area: *e.g., Prepare budgets*

Description of Workplace Context: *This should NOT be simply a repeat of the Activity Topic / Skill Area, nor should it be school-based. In other words, DON'T just say, "Students need to prepare budgets," or "It is very important to prepare budgets." Instead, explain WHY it is important.*

This section should answer the student's eternal question, Why is this important to me in real life? It should focus on what workers do, and it should explain in more detail how the topic/skill is actually used on the job (e.g., in what situations, under what conditions?). It should also explain why the skill is particularly important—if it is (e.g., what could happen if the worker doesn't possess this skill or doesn't perform it well?).

Description of Related Classroom Activity: *This section needs to provide a clear, detailed, step-by-step explanation of the activity. It should be written so that an applied academics teacher who knows little or nothing about the occupational area could actually present the activity.*

Materials / Equipment: *Just list the major ones.*

Estimated Time Required: *e.g., four 50–minute periods*

Extended Activity: *This section should provide creative, challenging ways in which the students can pursue the lesson topic in more depth or breadth.*

Authors: *List each teacher, subject area, and the school.*

Hint: To be able to share your plans with others, you need to provide sufficient detail so that it will make sense to someone else. If another teacher cannot replicate the lesson because you have failed to include full explanations or complete information, the plan is not helpful.

Integrated Vocational-Academic Lesson Plan

Occupational Area:

Academic Area:

Activity Topic / Skill Area:

Description of Workplace Context:

Description of Related Classroom Activity:

Materials/Equipment:

Estimated Time Required:

Extended Activity:

Authors (name, teaching area, school):

Culinary Arts,
Graphic Arts

Occupational Areas: Culinary Arts, Graphic Arts

Academic Area: Applied English

Activity Topic / Skill Area: Creation of a Restaurant Menu for a Specific Region

Description of Workplace Context: Every food service operation needs some form of menu that is developed based on an awareness of the needs and wants of the potential customers and of the costs involved. In addition, teamwork is an integral part of workplace success. It encourages appropriate interaction among individuals and fosters a cooperative atmosphere that is conducive to increased productivity.

Description of Related Classroom Activity:

- Culinary Arts: Students were teamed in pairs, and each team selected a specific region for menu development. The next step was to conduct some type of research—either formal or informal—to track food trends and determine food preferences for the selected region.
- Applied English: Various types of research sources and instruments that could be used to gather the needed information were discussed. Students then used the school and public libraries to research their chosen regions.

  They also developed a rough draft of a research instrument that could be used to obtain regional food preferences. The draft was checked for spelling, punctuation, accuracy, and completeness of information. Once revised, the instrument was saved on computer diskette for later use and editing when/if necessary.
- Culinary Arts: Each team used its research to develop a rough menu, and costs of menu items were calculated. Wording, structure, and format were discussed.
- Applied English: Each rough menu was worked on to develop a format and appropriate wording to "sell" the menu items. The content was checked for spelling, punctuation, accuracy, and completeness of information. It was then saved on computer diskette for later use and editing when/if necessary.
- Culinary Arts / Graphic Arts: Once the content of the menus was completed, each culinary arts student paired up with a graphic arts student. Together, they selected font, typesetting, graphics, and paper for the menu, and then the menu was "professionally" laid out, designed, and printed.
- Culinary Arts: Completed menus were displayed in the student restaurant, and some of the items from the menus were used as restaurant "specials."

Materials / Equipment: Dictionaries, pens, pencils, paper, computers with word processing and/or graphics program, library access, research materials

Estimated Time Required: 3-4 weeks

Lesson Results: This was a very good project for the students. It taught them that more goes into developing a menu than just putting food items on a piece of paper. The students worked well together and produced a product of which they were proud. In the future, we would try to involve the mathematics teacher as well, to help students in computing the desired profit margin and pricing the food items.

Authors: Carrie Hamilton, Culinary Arts; and Pam Wade, Applied English; Lima Senior High School; Suzi Hyden, Applied Communications, Springfield-Clark JVS

Culinary Arts

Occupational Area: Culinary Arts

Academic Area: Applied English

Activity Topic / Skill Area: Development of a Restaurant Reservation Form

Description of Workplace Context: Reservation forms help a restaurant to run smoothly and effectively.

Description of Related Classroom Activity: The same approach was used as described in the "Restaurant Menu" plan. Students worked in pairs (1) to determine what information should be included on such a form and (2) to create a form designed to document reservations easily and efficiently. They polished their forms in English class (spelling, punctuation, accuracy, completeness).

Materials / Equipment: Dictionaries, pens, pencils, paper, computers with word processing and/or graphics program

Estimated Time Required: One lab period in culinary arts; two class periods in English

Lesson Results: When students saw their product being used on a daily basis in our student restaurant, there seemed to be an increased feeling of pride and ownership. In the future, it would be helpful to involve the graphic arts teacher. He or she could explain the printing process and any restrictions students need to be aware of in developing such forms. He or she could also discuss the issue of printing costs (e.g., varying costs of different types of materials). We might also be able to involve the graphic arts class in the actual layout, design, and printing of the forms.

Authors: Carrie Hamilton, Culinary Arts; Pam Wade, Applied English; Lima Senior High School

Occupational Area: Culinary Arts

Academic Area: Applied English

Activity Topic / Skill Area: Development of a Customer Comment Card

Description of Workplace Context: Restaurants use customer comment cards to provide customers with a vehicle to express their opinions, satisfactions, and/or displeasures; and to help gather the information they need to ensure proper service, excellent food quality, a pleasing atmosphere, and customer satisfaction.

Description of Related Classroom Activity: The same approach was used as described in the "Restaurant Menu" plan. Students worked in pairs (1) to determine what items should be included on such a card and (2) to create a card designed to allow customers to easily provide the information needed. They polished their cards in English class (spelling, punctuation, accuracy, completeness).

Materials / Equipment: Dictionaries, pens, pencils, paper, computers with word processing and/or graphics program

Estimated Time Required: One lab period in culinary arts; two class periods in English

Lesson Results: A graphic arts senior was able to print the comment cards for the class. They are now being used in the restaurant with much success.

Authors: Carrie Hamilton, Culinary Arts; Pam Wade, Applied English; Lima Senior High School

Occupational Area: Culinary Arts

Academic Area: Applied English

Activity Topic / Skill Area: Development of a Catering Job Sheet

Description of Workplace Context: A restaurant needs a catering job sheet that includes detailed directions for food table setup so that all food tables are set up appropriately and the service runs smoothly.

Description of Related Classroom Activity:

- Culinary Arts: Students were paired, and each team was given a different menu. They then researched the information needed to develop job sheets that detailed directions for food tray and table setup, including how much of each item would be needed, the cost of each item, and how to prepare each item.
- Applied English: Students developed a schematic, format, and appropriate wording for their job sheets in English class and then polished the results (spelling, punctuation, accuracy, completeness).
- Culinary Arts: Teams switched job sheets, and each team created the food (trays) specified by the job sheet it was given and then set them out on specific food tables. The groups checked each other's work, and if there were problems, the job sheet was checked for accuracy and readability. Sheets were then revised for use in the future.

Materials / Equipment: Dictionaries, pens, pencils, paper, computers with word processing and/or graphics program

Estimated Time Required: Four lab periods in culinary arts; two class periods in English

Lesson Results: Again, involvement of the applied math teacher and graphic arts teacher and students could have strengthened the project.

Authors: Carrie Hamilton, Culinary Arts; Pam Wade, Applied English; Lima Senior High School

Occupational Areas: FCCLA Cluster Programs

Academic Areas: Technical Communication, Applied Science

Activity Topic / Skill Area: Apple Project

Description of Workplace Context: The ability to be part of a team project and to communicate with and understand the needs of those with different occupational backgrounds is expected in the workplace.

Description of Related Classroom Activity: The project integrated the FCCLA (Family, Career & Community Leaders of America) programs within our cluster (Culinary/Hospitality, Commercial Baking, and Child Learning), as well as the related academics. It provided a theme that tied the cluster programs together in various activities over a 1-month period.

- Child Learning: Students developed apple-themed games for preschoolers. For example, one student made a felt board with a large apple tree and a basket of individual apples, each having a number on it from 1-10. As the child counts, he or she puts the corresponding numbered apple on the tree. Students also created recipes for children's snacks with apples as an ingredient—simple recipes that children could prepare.
- Culinary Arts/Commercial Baking: Students researched recipes containing apples in cookbooks and on the Internet. They taste-tested several different apple varieties in their cooked and uncooked states and charted them by taste, texture, and usability in recipes (e.g., effects of baking on different apples, how they "juice out").
- Applied Science: Students discussed the use of pesticides (Alar), nutritional content of apples, pasteurization (with juices), and techniques for preserving apples, including drying.
- Technical Communication: Students wrote instructions for making the games they had designed or for preparing the recipes they had found or developed. The resulting instructions were reviewed by peers and instructors, and the best were selected and put into a booklet for distribution at open houses and child care centers.

Materials / Equipment: Art supplies, apples, cookbooks, publishing software

Estimated Time Required: Periodic activities over a 1-month period

Lesson Results: The lesson was successful and will likely be used again with a different theme (i.e., not apples). Hopefully, additional subjects and instructors, such as social studies, will be included in the future.

Authors: Patricia Andrews, English/Technical Communication; Debra Moy, Hotel Operations and Hospitality; Scarlet Oaks Career Development Campus

Occupational Area: Hospitality

Academic Areas: English, Employability

Activity Topic / Skill Area: Careers in Hospitality

Description of Workplace Context: Job satisfaction starts before job entry, with knowledge of the various entry-level and advancing positions offered in the industry. Although hotels are a viable career option for food service students, many have discounted those positions in the past.

Description of Related Classroom Activity:

- Hospitality: On the ***first day***, students viewed a video on career opportunities in hospitality and then did background reading about specific entry-level and advancing positions in the lodging and/or food service industry. On the ***second day***, students participated in a field trip to a nearby full-service hotel to view careers in action and then prepared individual field trip reports for homework. On the ***third day***, students completed written assignments that included researching a career position (in the Instructional Materials Center) and creating a personal career ladder.
- English: Students paraphrased definitions for vocabulary words related to the career exploration activities (i.e., 44 key words used in the hotel and hospitality field) and then created glossaries on the computer in accordance with detailed directions provided.
- Employability: Students explored the benefits offered in the food and lodging industries (sample benefit packages) and completed a series of puzzles and paper-and-pencil activities involving use of the vocabulary words.

Materials / Equipment: American Hotel & Motel Association Educational Institute's high school curriculum, VCR/TV, OCIS and other career resources, technical support

Estimated Time Required: Related instruction (hospitality) involved three 2.5-hour blocks of time and was team-taught by culinary arts and hospitality instructors. English and employability classes each involved three 45-minute periods.

Lesson Results: Coordinating these activities required a tremendous amount of communication among teachers throughout the planning and implementation stages. Students with difficulty managing their time needed specific short-term deadlines to get all the work completed. At the end of the unit, all students (as indicated by their work) viewed culinary arts as a path into hotels or hotels as a path into culinary arts.

Extended Activity: Throughout the school year, industry professionals will speak to the students on their positions and career paths. Students will job shadow at hotels in the spring.

Authors: Patricia Andrews, English/Technical Communication; Debra Moy, Hotel Operations and Hospitality; Scarlet Oaks Career Development Campus

Occupational Area: Hospitality

Academic Area: Applied Communications

Activity Topic / Skill Area: Dealing with Problems on the Job

Description of Workplace Context: Knowing how to approach problem solving systematically and how to deal with difficult coworkers and managers are critical skills for workplace success. When individuals lose their jobs, it is most often as a result of problems in dealing with other people, not lack of technical skills. Dealing effectively with people is at the heart of the hospitality industry.

Description of Related Classroom Activity: Since this teaching team does not share students or schools, they developed joint plans for each to present in their separate classes, one hospitality, one English. The hospitality teacher provided the occupational context; the English teacher helped with the development of activities to develop communication and teamwork skills.

- Problem Solving: Problem-solving strategies are taught using a standard text such as *How to Manage Conflict: A Practical Guide to Effective Conflict Management* by William Hendricks (National Press Publications, 1991). Then students apply the process to a list of typical job and home problems provided by the teacher. First they consider the problem individually and list possible solutions. They then work together in class to brainstorm as many alternative solutions as possible. They discuss each solution (pros, cons) and select the best one. They also role-play several solutions and possible outcomes.

  When students then experience problems on the job that they feel comfortable sharing, the group problem-solving process is repeated. The student with the problem then tries to implement the solution in real life and provides feedback to the class on its effectiveness.

  Students keep journals in which they document problems they encounter, the problem-solving steps they use to deal with each problem, and how well their selected solution strategy works. The instructor reads the journals twice a quarter.

- Dealing with Coworkers: This builds on the problem-solving activities, but this time the problem is relations with a coworker. Students are given the following scenario: You have a coworker with whom you'd had a problem you thought was resolved. Then you spoke to that person in the hall and there was no response.

  Classroom discussion focuses on questions such as the following: Is the problem really solved? How do you respond? How can you solve this without getting the boss involved? What happens if the boss gets involved? How would it affect your career if you complained every time such a situation occurred?

  As students suggest answers, their appropriateness is discussed. For example, what would be the consequences of handling the situation by "punching the person's lights out"? Would that improve the relationship? please the boss? Serious, positive solutions are sought; and negative, violent, nonproductive solutions are eliminated.
- Management Styles: Students are introduced to the nine personality types identified by Robert N. and Robert M. Bramson in their book *Coping with Difficult People* (Dell Books, 1988 paperback reissue edition). For each type (Sherman Tanks Exploders, Snipers, Complainers, Wet Blankets, Bulldozers, Clams, Superagreeables, Indecisives), there is a description of how the type behaves and what to do to deal effectively with that type.

  Students (who are all employed) then chart how their bosses treat people, both themselves and others. After students track this information for a set period, they analyze the results and select each boss's main style. Does the boss treat all people the same; does he or she always exhibit the same style? If there are differences, is there a common denominator (e.g., are the people "favorites" or new; does the behavior vary according to time of day or day of the week)?

  Students document in their journals different strategies they used in dealing with the boss based on his/her style and analyze their effectiveness. Which worked? Which didn't? Why didn't it work?

  Students could also be asked to find magazine articles or short stories that deal with a particular personality type and how others dealt with him or her.

Authors: Joy Whitehair, Applied Communications, Miami Valley Career Technology Center; and Abukar Arman, Hospitality, North Adult Education Center

Occupational Area: Marketing

Academic Area: Applied Communications

Activity Topic / Skill Area: Creating Webpages to Market a Product

Description of Workplace Context: One very real medium for marketing today is the Internet. Creation of Webpages that effectively market a product is a needed skill.

Description of Related Classroom Activity: Prior to beginning this unit, arrangements were made with the people whose support would be required: librarian/media specialist, technical support person, and computer teacher. Access to telephones, telephone books, software catalogs, and other supporting materials was also arranged.

- Day 1: Students spent time in the library/media center being oriented to what the facility had to offer.
- Day 2: Students were given samples of Webpages (in print form). Discussion focused on what a Webpage is and what elements Webpages typically contain. Which of those elements is necessary, which simply desirable? Students next brainstormed resources they could tap to find out what they need to know in order to create a Webpage. Students were then divided into five groups, and each group was assigned to conduct research on how to develop a Webpage using ***only one*** type of source (e.g., reading books, using software tutorials, talking to an in-school technical expert, surfing the Internet, using CD-ROM materials).
- Days 3-7: Groups conducted their research, being careful to stick to the one type of source assigned. In other words, the technical expert needed to provide information only in oral form, rather than giving students documentation or software to use. Students were also required to identify ten Webpage addresses (e.g., from magazines, products, TV shows). They then wrote up summaries of their findings (with complete citations for the specific books, articles, software, etc., used) for submission to the teacher.
- Days 8-9: Students prepared oral presentations, with supporting visual aids, for sharing their findings with the total class.
- Days 10-11: Students presented their oral reports.
- Day 12: Students met in the computer facility for a demonstration of how to create a Webpage.

- Days 13-14: Students were asked to select a product or service (real or imaginary) to market/advertise on their individual Webpages. They worked in the library/media center to gather the information they needed to effectively promote that product or service.
- Days 15-19: Students worked on their Webpages in the computer lab. Once completed, all pages were printed out.
- Day 20: Students mounted all pages of their Websites on posterboard for display in the classroom. Students could vote by "silent" ballot for the best Websites in various categories (e.g., most interesting, most creative, most innovative, most likely to sell the service/product).

Evaluation considered the quality of the printed version (accuracy of content, spelling, format, etc.), how easy it was to navigate the online version, and students' daily effort.

Extended Activities:

- Government: Students could created Webpages where they provide information about a candidate or a political issue.
- English: Each student could select a geographic location featured in a book or short story and create a travel brochure for the area for presentation on a Webpage.
- Applied Communications: Students could create a Webpage designed to help recruit students for the vocational program.
- Mathematics: Students could create math puzzles and games and design a Webpage to "sell" those products.
- Science: Students could create a Webpage that demonstrates the assembly of a product they made with recycled materials.
- Foreign Language: Students could create a Webpage promoting travel to a country where the language is spoken.
- Marketing: Students could create a Webpage promoting the malls they "developed" (see p. 94) and/or marketing available retail space.

Authors: Lorre Hedrick, Marketing; Caryn H. Jackson, Mathematics/Science; Kimberly Tavenner, Applied Communications; Tolles Technical Center

Occupational Areas: Marketing, Early Childhood Education

Academic Areas: Applied Science/Physics, Applied Communications, Applied Math

Activity Topic / Skill Area: Creating and Marketing Toys/Games

Description of Workplace Context: Toys and games are an integral part of both childhood and adult life (just more expensive). The problem solving and creativity required to develop and market these types of devices are useful skills to possess in the marketplace.

Description of Related Classroom Activity:

- Early Childhood Education: Discussion focused on toys: their purpose and the different types available. Students were quick to point out that children sometimes ignore the "fancier" toys and play instead with a pot and a lid from the kitchen—that a toy is simply some item that fascinates a child and provides creative play. Students could also be asked to conduct library or online research on toys, the science involved in their creation, their uses as teaching devices, and so on.
- Applied Science/Physics: Students were told they would each be making a toy in class and were invited to select their materials from a box of recyclable and/or common household items (e.g., string, yarn, coffee filters, empty juice containers, tape, jar lids, Styrofoam packing material, pop bottle lids, straws, plastic jars and cans, glue, rubber bands, empty paper-towel tubes). These can be provided by the teacher or collected by the students. Students then created their toys, applying science principles as needed and testing their products as they went along.
- Applied Communications: Students wrote detailed instructions for how to construct their toys. Instructions were then exchanged, and each student attempted to construct the "new" toy using the directions provided. After students finished construction, they provided written feedback on the effectiveness of the instructions (e.g., thoroughness, clarity, ease of use, accuracy). The authors of the instructions were provided with the written feedback as well as the actual toy developed using their instructions. They then reworked the instructions as needed on the basis of the feedback .
- Marketing: Marketing students could each be paired with a toy developer and asked to create a campaign for marketing the toy.
- Applied Math: Students could work on identifying cost factors involved in toy production (materials, labor, etc.) and calculating the price to be charged.

Authors: Lorre Hedrick, Marketing; Caryn H. Jackson, Mathematics/Science; Kimberly Tavenner, Applied Communications; Tolles Technical Center

Occupational Work Experience(OWE)

Occupational Area: Occupational Work Experience (OWE)

Academic Areas: English, Economics

Activity Topic / Skill Area: Junior Achievement Eco-Pen Simulation

Description of Workplace Context: In the business world, different departments are responsible for different decisions concerning any given product. These departments must work together if the product is to be successful.

Description of Related Classroom Activity: In the Junior Achievement simulation, the Eco-Pen is a pen that stores whatever information you write. Students make decisions about the product that will affect their company's performance. These decisions are entered into the computer, and the students' company competes against the computer's company. After each round, the classes received a printed report showing how their company did based on their decisions. The report also provides clues concerning the decisions to be made in the next round.

- OWE: Students were responsible for all decisions concerning setting the price.
- English: Students were responsible for all decisions concerning marketing. They role-played a marketing firm hired by the company on a consulting basis.
- Economics: Students were responsible for all decisions concerning research, development, production, and capital investment.

Lesson Results: At the end of three rounds, the students' company was showing an increased profit from round one; however, the computer's company was still ahead in total profit. In the future, it would help to involve a mentor from the business community in each class.

Estimated Time Required: Periodically throughout a 3-week period

Authors: Diane Blankenship, Economics; Tina Lee Callahan, English; Garry Hall, OWE; Wellston High School

Occupational Area: Occupational Work Experience (OWE)

Academic Areas: English, Journalism, Economics

Activity Topic / Skill Area: "School Picture Day" Project

Description of Workplace Context: Teamwork, problem solving, and team decision making are essential elements in today's business world.

Description of Related Classroom Activity: The front entrance to the school building had developed an ill-kept appearance. An improved appearance was needed to enhance school pride.

- English: Students developed a proposal for the project and presented it orally to the principal to secure approval for the project.
- Economics: Students were responsible for doing a cost analysis to determine the best price for the mulch to be purchased.
- OWE: Students prepared the site for improvement and carried out the manual labor once the materials arrived.
- Journalism: Students covered the project for the school paper.

Lesson Results: When the project was completed, students, staff, and administrators all commented on the improved appearance of the building's entrance. The janitor noted that he had observed a considerable decline in the amount of litter in the area once the project was completed. In future projects of this type, however, more detailed planning is needed in order to integrate more students into the project.

Authors: Diane Blankenship, Economics; Tina Lee Callahan, English; Garry Hall, OWE; Wellston High School

Travel &
Tourism

Occupational Area: Travel & Tourism

Academic Areas: Applied Communications, Applied Math

Activity Topic / Skill Area: Coupon Book Project

Description of Workplace Context: For a product or service to be successful, it must have a perceived value for the targeted consumers and they must be aware of its existence. Ensuring that it meets these criteria involves many occupational and academic skills essential to workplace success.

Description of Related Classroom Activity: Students secured promotional offers from businesses in the hospitality/travel & tourism field (lodgings, attractions, travel agencies, tour operators, food and beverage establishments, etc.); designed ads and produced coupon books; and sold the coupon books. In the process, they applied a wealth of sales, marketing, advertising, accounting, communication, mathematics, problem-solving, and critical thinking skills. They got out into the community and acquired experience in talking to retailers. The project was also a fund-raiser for the vocational student organization. Learning first, fund-raiser second!

- First 9 Weeks: Students create a general design for the coupon book, with input from the selected printer; develop policies (e.g., discount, date, and size restrictions) for creation of the book and coupons; and create forms for controlling the activities and the money collected. They create a marketing plan that addresses issues related both to "selling" the ads (i.e., securing the participation of merchants) and to selling the finished coupon books. Questions to be answered regarding selling the ads include what will the cost of ads be, who will you sell to, how will you contact them, and how will you track this activity? Questions to be answered regarding selling the books include what will the cost of the coupon books be, who will you sell them to, how will you contact them, how will you track this activity, and how will you promote book sales?

  Students then sell the ads according to their stated plans. For example, our students sent letters introducing the project to local businesses and to major travel and tourism establishments throughout Ohio. Forms, policies, and guidelines were included with the letters. Students then divided the local merchants among them and made personal sales calls. They followed up those calls with letters, phone calls, or personal contacts, depending on what seemed to be appropriate to make the "sale."
- Second 9 Weeks: Students design the ad for each coupon using the information provided by the merchants. Ads must be designed in accordance with the printer's specifications. Each coupon is sent to the merchant featured for review and approval. Once all coupons are approved, they are delivered to the printer. Students help assemble the coupon books (a cost-saving step).

- Third 9 Weeks: Students attempt to sell all the coupon books printed according to the marketing plan. It is recommended that they revisit the plan at this point and revise it as necessary to ensure that the right markets—both in and out of school—are targeted and students have incentives for selling. Students also design forms for documenting all books printed and all funds received, and use those forms to record all transactions.
- Applied Communications: Students can work on the oral communication skills needed to sell both the ads and the books (e.g., making effective cold calls and personal contacts; producing effective letters). Role-playing activities can be very useful here.
- Applied Mathematics: Both general mathematics and algebra are required for this project. Students need to count money, make change, calculate percentages (e.g., value of individual coupons, commission for each book sold), and keep accurate financial accounts. Algebra is used for evaluating business formulas (e.g., gross profit = product – cost of product; net profit = gross profit – all expenses) and graphing (e.g, graph linear equations, plot coupons sold/profit, find slope).

Project Results: The first year we did this project, we discovered how much its success depends on work of the first 9 weeks. The merchants featured in the first book did not appeal to the potential customers. Thus, even though there was good value, it was not *perceived* value, and the books didn't sell in the quantities desired. In addition, the coupon books the first year were very inexpensively produced and packaged. Although this saved money up-front, the results were unappealing—another reason for lower-than-hoped sales.

During the second year, great stress was placed on the work of the first 9 weeks. Students identified and contacted businesses with high appeal to the people in their target market. Having coupons that appealed to them also made it easier for students to sell the books with enthusiasm. In addition, we spent more on the printing process and found that a small additional investment yielded a much better-looking—and more salable—product. Each coupon carries the following message at the bottom: "Thanks to this merchant, Hospitality and Tourism students of Knox County Career Center and Licking County JVS will have enhanced learning opportunities."

Authors: Darrell Banks, Travel & Tourism; Robert M. Stumpf II, Applied Communications; Ryan Wright, Applied Mathematics; Knox County Career Center (This project was originally conceived and developed by Darrell Banks and the late Jodi Ryan of Licking County JVS.)

Occupational Area: Travel & Tourism

Academic Areas: Applied Communications, Applied Math, Social Studies

Activity Topic / Skill Area: Problem Solving & Group Dynamics

Description of Workplace Context: Employers want workers who are skilled problem solvers, and problem solving often requires teamwork.

Description of Related Classroom Activity: Students are divided into groups and must work together on all activities. Each member of the group earns the same "group grade," which constitutes 50 percent of their grade for the period. The other 50 percent is determined by grades for individual participation and written assignments.

- Group Dynamics: The program used, "Cascades Survival," places each group in a simulated situation where members have to determine the relative importance of the items left in a plane after it has crashed in the Cascades Mountains. Students first rate the items individually and then as a group. Finally, they are shown the ratings of a "professional." Each student compares his or her ratings to those of the group and of the professional. Invariably the group's ratings are closer to the professional's than are the ratings of any individuals. This provides an object lesson for students in the value of the group dynamic.
- Problem Solving: Students are walked through the steps in problem solving and then given the following scenario: A cafeteria in an industrial plant has changed its menu, and the result has been an increase in customers. Unfortunately, this has also created longer, slower lines, which, in turn, has made it impossible for all employees to be fed during the normal lunch period. Each group must gather data about the problem, determine cause-and-effect aspects, develop three possible solutions, evaluate each solution, and select the best one.
- Occupational Application: Each group is then required to apply problem solving and group dynamics effectively in developing tours with an historical theme (which can be selected, if desired, in conjunction with the social studies teacher). Three tours must be developed initially by each group. The starting point is Mount Vernon, Ohio, and each tour may have only one primary destination, but any number of secondary ones. Each tour must last 2 days and 3 nights.

  After students have selected their destinations, they must develop complete itineraries for each tour. What route will be followed, what attractions visited, and what events attended? How will everything be scheduled so that adequate rest stops are provided (e.g., every 2 hours while en route) and stops for meals, lodging, attractions, and events occur at the desired times? Students also need to take into consideration any regulations affecting provision of the tour (e.g., coach drivers may not drive more than 10 hours per day).

Pricing must be part of each tour package. Students need to identify all costs (e.g., tour guides, motorcoaches and drivers, two included meals, lodging, admission fees for scheduled attractions) and desired profit margin in calculating the price to charge for each tour. This can be handled in applied mathematics classes if desired.

Once all three tours have been developed, each group examines their relative advantages and disadvantages and decides which tour is "best." Groups then present their work to the total class and defend their selection of the best tour. Each individual student also submits a written report describing his or her part in the group presentation.

Authors: Darrell Banks, Travel & Tourism; Robert M. Stumpf II, Applied Communications; Ryan Wright, Applied Mathematics; Knox County Career Center

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Area: Applied English III, Social Studies

Activity Topic / Skill Area: Research / Referencing

Description of Workplace Context: Business and industry are now part of a global paradox whereby the smaller company is a major team player in the final product. An awareness of the global ties of local manufacturers becomes visible with global identification and mapping.

Description of Related Classroom Activity: During a student internship or other on-the-job experience, students are to compile a list of the business's major customers, clients, suppliers, etc., and their geographical locations. (Students might discover that a small-town business subcontracts for a St. Louis firm that is working on a job for Beijing, China.)

Armed with this information, students will return to the English classroom and, using reference tools, locate the towns and/or states and/or countries on a wall map. Students will also create a legend for the map, color-coding pins/flags to the business and its customers, clients, subcontractors, etc.

Materials / Equipment: Reference materials (encyclopedias, computers with related software, wall map, identification pins)

Estimated Time Required: Class Period

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Communications

Activity Topic / Skill Area: Time Management

Description of Workplace Context: There's more to work than producing a model product. The product must also be produced in a timely fashion. The secretary who takes 3 days to produce that perfect letter will not last long in the workplace. The marketing proposal that is completed a day after the final deadline is not a winning proposal.

Description of Related Classroom Activity: Students are provided with information on time management and with One-Minute Manager Goal Sheets adapted from Kenneth Blanchard's book, *The One Minute Manager* (Berkley, 1993). Each student must then complete one of those sheets for each 3-hour vocational lab (or workday at a co-op placement). This involves the following steps:

- At the beginning of each session, the student writes down his or her goals for the session. The goals must be stated in behavioral terms and in positive language (e.g., ***not*** "I will not waste time."). The student must then indicate an estimated time to reach each goal. Where goals are large, they should be broken down into steps. For example, if the goal is to cater a banquet, one step might be to set up the serving area.
- The student records the time work was begun and completed on each goal. If it takes longer than estimated to complete a goal, the student must prepare a written summary statement describing the circumstances that caused the delay.
- The goal sheets are handed in to the applied communications teacher daily. Three points are awarded for a sheet that meets all requirements, and the total points earned for these sheets make up 30 percent of the quarterly grade. Points are deducted for missing information, misspelled words, and grammatical errors in written summary statements.

Lesson Results: Students come to see the value of time management and how it affects job performance. Having students do the sheets also provides for closer interaction between the applied communication and vocational teachers. Furthermore, the applied communication teacher learns a great deal about the occupational context—what tasks students actually perform in the lab and on the job—by reviewing these daily forms.

Authors: Darrell Banks, Travel & Tourism; Robert M. Stumpf II, Applied Communications; Ryan Wright, Applied Mathematics; Knox County Career Center

Occupational Areas: Any and All Vocational Programs

Academic Areas: Any and All Academic Areas

Activity Topic / Skill Area: Math Day

Description of Workplace Context: Measurement is part of most every occupation. Accurate measurements are essential.

Description of Related Classroom Activity: Many students have trouble with measuring. They do not have enough hands-on experiences to really understand the customary systems of measure and the conversions they are asked to make in science and math classes. Students in social studies work with maps and must be able to read scales and legends in order to determine miles and square miles. Students in technology and computer classes must be able to measure angles and construct right angles for class projects in which they build towers and bridges, and they must test the structures to determine how much weight they can hold.

Teachers in five classes taught short daily lessons that would prepare students to take part in Math Day. The lessons included measurement of length, liquids, area, perimeter, surface area, and angles.

On Math Day, students were divided into groups of four, with the ability levels of the groups equalized insofar as possible. Each room contained a series of exercises that the groups had to complete. In some rooms, for example, there was a series of stations, each with a different exercise, and students spent 10 minutes at each station. They could earn 20 points per classroom, for a total of 100 points.

- Classroom 1—Precise Measurement: Students measured various items to the inch, 1/2 inch, 1/4 inch, 1/8 inch, and 1/16 inch. Measurements needed to be exact.
- Classroom 2—Measurement of Area, Perimeter, and Surface Area: Students had to find the perimeter of the classroom, the area of the chalkboard, the surface area of the four walls, and the surface areas of rectangular solids.
- Classroom 3—Outside Measurement and Estimation: Students had to estimate a linear measurement, and then use a measuring tape to check their estimate.
- Classroom 4—Liquid Measurement: Students were given 1.5 gallons of water and had to prove the number of cups, pints, and quarts in this amount of liquid by taking a cup and seeing how many times they could fill it from the 1.5 gallons.
- Classroom 5—Map Scales and Angle Measurement: Students were given maps and asked to determine the miles between countries and cities using the "miles per inch" scale in the legend. They also had to measure and construct angles of various degrees.

Materials / Equipment: Rulers, tape measures, yardsticks, protractors, laser ruler, and measuring cups

Estimated Time Required: Entire school day

Authors: Bill Fletcher, Tech Prep Algebra; Susie Fraser, Tech Prep English; Terry Hollinger, Tech Prep Computer and Technology; Groveport Madison Freshman School

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Area: Applied English, Applied Mathematics

Activity Topic / Skill Area: Developing Graphs; Locating Information; Reading for Information

Description of Workplace Context: Newly hired workers need to gather information from worksites on attendance, pay scales, and processes.

Description of Related Classroom Activity: Through a teaming procedure, students will gather worksite information as outlined by participating teachers. They will then develop graphs in Applied English to compare and contrast information gathered from various worksites. These graphs will include information on employee attendance and the individual student's attendance, which will also be compared to various worksite attendance policies. Processes used at various sites will also be graphed to compare and contrast such factors as pay scales, number of employees, gender, etc. This will allow students to measure their present performance to real-world business standards/expectations and give the students a better picture of the business they plan to enter.

Materials / Equipment: Pen/pencil, data gathered, paper, graphics software program and computer (optional)

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

Occupational Areas: Any and All Vocational Programs

Academic Areas: English, Mathematics

Activity Topic / Skill Area: Reading Story Problems

Description of Workplace Context: Sometimes an individual on the job has the knowledge and ability to solve a problem but lacks the critical reading and/or vocabulary skills to navigate the problem statement. This is particularly true in mathematics.

Description of Related Classroom Activity:

- As a teaching team, develop a list of vocabulary terms you want to cover. We chose to concentrate on math terms because we're hoping to boost math proficiency scores, and we believe vocabulary and reading skills are an issue in successfully taking the test.
- Decide on a weekly basis which terms you will concentrate on (5-10 maximum).
- Decide how the terms will be covered in the different classes without duplicating efforts. Class exercises can include analogies, open-ended questioning, true/false questions, creative matching, rhymes, fill-in-the-blank, lists, charts, contextual examples, crosswords, analysis of relationships, structural diagrams and models, and sequence diagrams. Exercises should vary from week to week and should be those most effective for the particular student group.
- In conjunction with developing a common vocabulary, teach analytical reading skills. Students often overlook important details or concentrate on irrelevant details. They make faulty inferences and illogical predictions. They may miss the main idea. We are currently integrating math story problems into the English curriculum, using 10 minutes out of the period to study the problems in terms of detail, inference, prediction, etc. If possible, the story problems can be drawn from the context of the students' occupational program(s).

Estimated Time Required: May be for a particular unit or for the entire year

Lesson Results: We have only begun to implement this, so our results are sketchy. Nevertheless, positive student response suggests that the idea for a common vocabulary is a practical one. We assume student knowledge and understanding that is not always there—or there only on a very limited level. We have learned, however, that it is important to start with a short list of terms—covering more is too difficult to handle effectively.

Reinforcing the critical reading skills has been advantageous as well. It really has been surprising the number of faulty inferences students make. Also, they often tend to concentrate on unimportant details instead of what is critical to solving the problem. In English class, we simply discuss the intent of the problem, not the answer. Again, it is important to start small.

Authors: Bill Fletcher, Tech Prep Algebra; Susie Fraser, Tech Prep English; Terry Hollinger, Tech Prep Computer and Technology; Groveport Madison Freshman School

Occupational Areas: Any and All Vocational Programs

Academic Areas: Applied English, Employability

Activity Topic / Skill Area: Job Fair

Description of Workplace Context: In nearly every business operating today, it is essential to know how to conduct a business phone call, write business letters, identify the right person to talk to within a large business structure, make clear requests for service or involvement of others in business, schedule time and space for business use, and present oneself for a business interview in a manner designed to best accomplish the interview goals. These are the very skills involved in setting up and operating a Job Fair.

Description of Related Classroom Activity: Students participating in job shadowing and 4-week internships have typically lacked the preparation and skills to get maximum benefit from the experience. To improve this situation, it was decided that students should be involved in organizing and managing a Job Fair, which would help them develop the skills needed to profit from their on-the-job experiences. The Job Fair itself would provide students with greater knowledge of specific jobs and the criteria for job placement.

- Students and teachers identify the businesses and industries to be contacted to participate in the Job Fair.
- Students work on their communication skills. How do you identify the person you need to talk to at each firm—the decision maker? What points do you need to make during the contact? (It's amazing how many students—in their zeal to convey the content—forget to mention their own name.) What strategies can you use that will help you convince the firm to participate? Once the skills have been covered, students practice them in role-play situations, which are videotaped and reviewed and critiqued.

  Students also develop a letter to send as a follow-up to the cold call. Standard business format is used, and the letter is carefully reviewed for spelling, punctuation, accuracy, and completeness.

  "Journaling" is used as well. Students keep written journals documenting their activities during the Job Fair process, from start to finish. When the Job Fair is over, students use their journal entries to prepare final written analyses.

- Using phone, fax, and computer, students contact employers—before, during, and after school—to solicit and secure their involvement in the Job Fair. As a rule of thumb, one teacher—with strong student help—can expect to succeed in securing the involvement of ***four*** businesses a month. And given the reality of other instructional requirements, the recruitment effort can usually only be sustained for two months.
- Students work on their interview skills. Again, role-playing and videotaping are used to provide students with needed feedback about their performance.
- During the Job Fair, each employer is located in an interview station, and each student is able to participate in a job interview with a real employer. Interviews last approximately 20 minutes, and brief breaks between interviews are provided. To calculate the number of interviews possible, figure 2.5 x stations x hours. Thus, if you have a 4-hour Job Fair (a reasonable time length) and 8 stations, you could expect 80 student interviews (2.5 x 8 x 4). An individual teacher who pulls together a Job Fair that yields 60 interviews has done very well, 80 interviews is fantastic, and more than 80 gives that teacher the right to appear in public in a Superman cape.
- When the interviews are completed and the stations are torn down and the room cleaned up, time is taken for reflection and celebration. Reflection may take the form of written feedback from all students, with one-on-one discussions with students who took leadership roles. A round-table approach could be used, as could pair-and-share, in which students discuss their reactions to the Job Fair in pairs and then share their common thoughts with the total group.

Materials / Equipment: Quiet, secure space with a phone for student use; computer and fax, if possible; computer support; video camera and playback capability; copying support

Authors: Bill Fletcher, Tech Prep Algebra; Susie Fraser, Tech Prep English; Terry Hollinger, Tech Prep Computer and Technology; Groveport Madison Freshman School

Occupational Area: Any and All Vocational Programs

Academic Area: Applied English III / Applied Mathematics

Activity Topic / Skill Area: Writing (organizing facts, details, and examples in logical order)

Description of Workplace Context: In the workplace, the paper trail is sometimes as important as the product. Time on task equates to quality control, quality assurance, and ultimately profit. The worker must provide as much information as possible on the job order to correctly charge the job. The weekly log is designed as a preliminary step to the work order job description.

Description of Related Classroom Activity: Using the Student Weekly Log (attached), complete the following steps:

Step One

- Fill out general information.
- Write legibly.
- Use correct spelling.
- Demonstrate completeness in all written materials.
- Organize facts and details in logical order.

Step Two

- On a daily basis, record jobs performed, skills learned, and questions you have in the appropriate areas on the form.
- Record starting and stopping times for each day (rounded to the nearest half hour).
- Omit Saturday and Sunday.
- Total hours for the week.
- Multiply hours x hourly rate (as assigned by teacher) to obtain Gross Wage.
- Sign your log sheet and date it.
- Submit log sheet to vocational teacher for additional comments and signature.
- Vocational teacher will submit to Applied English teacher for final evaluation.

Materials / Equipment: Handout

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

STUDENT WEEKLY LOG

Student _____ Employer _____

Report for Week of _____ to _____ Supervisor _____ Phone _____

JOBS I PERFORMED THIS WEEK	NEW SKILLS OR INFORMATION I LEARNED THIS WEEK

CONCERNS / QUESTIONS / PROBLEMS I HAVE

	Time Started Working	Time Stopped Working	Number of Hours Worked
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			

Total Hours _____ x Hourly Rate _____ = Gross Wage _____ Days Absent _____ Days Late _____

Instructor / Employer Comments

Student Signature _____ Date _____

Instructor/Employer Signature _____ Date _____

Occupational Area: Any and All Vocational Programs

Academic Area: Applied Math, Science, Communications

Activity Topic / Skill Area: Tour of a Work Site

Description of Related Classroom Activity:

- Applied Communications Class: Students research a place to visit, select a place, and write to that company requesting permission to visit and inquiring about safety requirements at that particular site. Students could also invite someone from the company to come to class to talk about the company and its products. After a brainstorming activity concerning what students want to see and learn during the visit, they prepare interview guides for the trip.
- Applied Math Class: Student activities focus on the types of jobs performed at that company involving math (e.g., payroll, inventory, schedules, charts, and records).
- Applied Science Class: Instruction covers subjects related to the products the company produces. For example, if students are to tour a plastic or stamping plant in which different types of plastics are used, students could study the way in which they are used for injection or blow molding and the mixing of color in plastics.
- Occupational Class: The vocational teacher covers concepts and tasks related to the company's product (e.g., plastic mold-making, use of different steels, working part of a mold).
- The Visit: Students compare what they see with what they learned in class, keeping notes of their findings. They ask questions using their interview guides.
- After the Visit: Students discuss what they did and saw and how it differed from what they expected. They write thank-you notes.

Authors: Jim Davis, Precision Machining; Sophie Garrity, Applied Science; Belmont-Harrison JVSD (St. Clairsville, Ohio)

Insert the
"Information
Superhighway"
Tab Here

The Information Superhighway

If you are already jogging down the Information Superhighway, you can skip ahead to the curricular resource list, which begins on p. 165. If not, the following is a simplified explanation of what it is and what it has to offer.

The Information Superhighway is an extraordinary access route to an enormous amount of information. These days, everyone and his or her uncle is putting up a Webpage on the Internet or World Wide Web, accessible by a URL. But what do these terms mean?

The Internet

Originally established during the Cold War as a mechanism for ensuring defense-related communication nationwide, the Internet has become a mega-network comprising—and allowing access to—other large and small networks.

When used in a nongraphical environment (think of IBM without Windows), the Internet was accessible mainly to those with significant computer skills. The rest of us could access only the tip of the iceberg. With a graphical environment (Macintosh or Windows) and the Net software available today, Internet access is quite easy and friendly.

Many forms of communication take place on the Internet. Under the Internet umbrella, users can search for information on the World Wide Web, communicate via e-mail, and participate in electronic newsgroups and listservs.

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The Web

Now, what about the *World Wide Web* (or simply, the *Web*)? Think of a spider's web—concentric circles connected with multiple cross-hatching. That's what the World Wide Web is like. It links documents together and allows you to contact one site and then connect to other related sites with a mere click of a graphic button (*surfing* the Net).

In subsequent pages in this section, we will look at some specific Websites relating to vocational education and applied academics. This list is not too extensive, and there's a reason for this. The Web changes constantly. Any print list is soon out of date. But not to worry! There are numerous search engines and sites whose sole job is to get you where you want to go on the Information Superhighway. Thus, the first list of sites at the end of this explanation will be those designed to help teachers locate additional sites of interest to them.

Browsers and Search Engines

A *browser* is software (e.g., Netscape Navigator) that, as its name suggests, allows you to browse (or navigate) on the Web. The browser may be provided by your Web service, or you can buy the software yourself.

Search engines in the browser (e.g., Magellan, Excite, Yahoo, Infoseek, Lycos) allow you to search an index of Internet subjects. Using one of these free devices, you simply key in the term(s) you want to search and it does the work. Most search engines provide help or search tips to aid you in locating the desired information, and most allow you to modify and narrow your search as you go along. The results display as a list of items, usually sequenced according to how likely they are to be relevant. You can then scan the list to see if you've gotten a "hit."

TKM's Education Web Search
<http://www.tkm.mb.ca/education>

Some search engines are designed specifically to locate resources for educators. However, even the general search engines usually allow you to pick a general subject such as *education* first before commencing your specific search.

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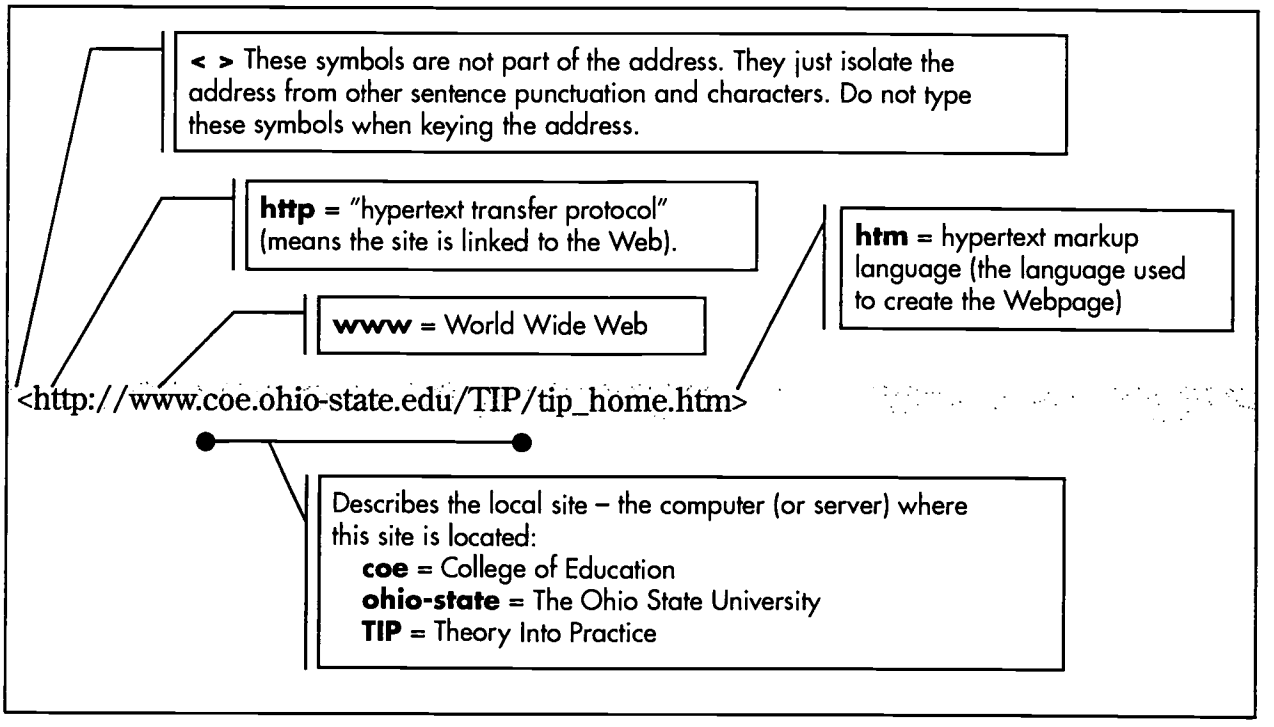
URLs

It is not necessary to use a search engine if you know the site's actual address—its URL, which means "uniform resource locator." As an example, let's decipher the Website address for the educational journal *Theory Into Practice*:

<http://www.coe.ohio-state.edu/TIP/tip_home.htm>



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Webpages and Homepages

A *Webpage* is everything at your Website—a misnomer since it's often more than one page. A *Homepage* is like a home base for the *Website.* It often gives a brief description of the individual or the organization that established the site, a menu of its contents, and descriptors you can click for more information on particular topics.

These days, the problem is not so much finding what you want—it's trying to stay focused. So much is available that you may spiral from one link to another, disappearing for hours or days as you peruse the fascinating contents of the Net.

- When you pick up a magazine, you're likely to see a Web address where you can get information or send e-mail to express an opinion.
- On TV, networks and programs often list a Web address for use by viewers. There are sites for new movies, fan clubs, sports teams, news organizations, and advertisers.
- Do you want to see what publications are available from a publisher? Just use a search engine to access its Website and search the catalog.
- Want to know what's happening of relevance to teachers at the National Science Foundation?
  - ✓ National Science Foundation <http://www.nsf.gov>
- Want to contact your professional association?
  - ✓ National Education Association <http://www.nea.org>
  - ✓ American Federation of Teachers <http://www.aft.org>
  - ✓ National Council of Teachers of English <http://www.ncte.org>
  - ✓ National Council of Teachers of Mathematics <http://www.nctm.org>
  - ✓ National Science Teachers Association <http://www.nsta.org>
  - ✓ Association for Career and Technical Education (formerly American Vocational Association) <http://www.acteonline.org>

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- ✓ National Business Education Association <http://www.nbea.org>
- ✓ American Management Association International <http://www.amanet.org>
- ✓ American Hotel & Motel Association <http://www.ahma.com>
- ✓ American Culinary Federation, Inc. <http://www.acfchefs.org>
- ✓ International Association of Culinary Professionals <http://iacp-online.org/iacpreg.shtml>

Notice the pattern in those Web addresses? Sometimes you don't need a search engine, just a little common sense. Acronyms are often used in addresses, followed by a descriptor of the type of entity:

- Organizations = *.org*
- Government agencies = *.gov*
- Colleges and universities = *.edu*
- Commercial firms = *.com*

E-mail

E-mail is "electronic mail"—messages that arrive at your computer when sent to your electronic mailbox address. (Your service provider will usually help you devise an acceptable mailbox address.) E-mail software (e.g., Eudora or Eudora Pro) allows you to access and transmit e-mail messages.

E-mail can have enormous benefits. Individuals used to spend hours playing telephone tag—calling and returning calls without ever reaching each other. Now an e-mail message can be sent directly to that individual, who can then respond at his or her earliest convenience.

The ease of communication is probably its chief benefit. Consider this example. Assume you are a new English teacher and some of the mail that arrives in your school mailbox (catalogs and such) is addressed to your predecessor. If you have to write or call to request that such mail now be addressed to you, you may not get around to it. If all you have to do is send off a quick e-mail message from your computer, you are much more likely to do it.

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Or consider international communication. Americans with business dealings with countries behind the Iron Curtain used to have a terrible time making contact because the phone systems were so archaic and because the time zone differences are so vast. As organizations and individuals in those countries have begun to come online, the ability to communicate has eased enormously.

Whereas an Internet, or Web, address gets you to a computer site and its contents, an e-mail address reaches a live human being. If, for example, you want to contact someone at Ohio's Vocational Instructional Materials Laboratory to ask a question or request material, you can simply send an e-mail message to <viml@osu.edu>. Many Websites provide an e-mail connection (i.e., click here to send an e-mail message to the originator of the site).

When you subscribe to a *newsgroup* (described below) that supports teacher chat, you will often find opportunities for Net pen pals. For example, a teacher, perhaps in Singapore, might give an e-mail address and ask for messages from American students. It is a small world after all.

Usenet Newsgroups

Newsgroups are established groups—or bulletin boards—related to a specific topic, to which Internet users can subscribe. Some are read-only news groups produced by news services (e.g., *clari* groups from Reuters). Some are for discussion—either open (no one's in charge) or moderated.

Searching for Newsgroups

If you have friendly software (e.g., Trumpet Newsreader), you can easily search the available open groups (and they are legion) using key words such as *teacher, science, math, english* (yes, english, not English; the search is case-sensitive), *business, food,* and *education.* A sampling from the over 500 newsgroups recently found in such a search is shown in the margins. People in these groups share information of potential interest to each group, express opinions, or ask for help in a particular area.

Sample Newsgroups:

k12.chat.teacher
misc.education
clari.news.education
clari.news.education.misc
clari.news.education.releases
sci.math
sci.math.num-analysis

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Subscribing

Today's friendly software makes accessing the newsgroups easy. For the most part, to "subscribe" you simply select the groups you want to follow. Subsequently when you open up the program, a list will appear of the groups to which you have subscribed. The program will let you scroll through the groups to see what messages have arrived. As each group is accessed, a list will appear of all messages received. Each is identified by its subject line, which allows you to get an idea of whether you want to read it or not.

Be advised: New users always want to subscribe to all groups even remotely of interest and to read all messages received. You cannot maintain this pace and keep your sanity (or your friends and family). Be selective in the groups you pick and the messages you choose to actually read. Particularly when a group is not moderated, there can be a tremendous amount of junk (or even offensive material) posted to the group.

Netiquette and FAQs

There are protocols (called *Netiquette*) for using these discussion groups, and if you violate these protocols, you can expect to be *flamed*—messages intended to slap your hand or, worse, insult your intelligence, will be posted publicly online. Your service provider should automatically subscribe you to a group for new users, which will regularly repost articles about protocols, procedures, and answers to *FAQs* (frequently asked questions). If you wish to be a knowledgeable participant—and to avoid being flamed—it is critical that you read them!

sci.math.research
sci.math.symbolic
k12.ed.math

k12.ed.science
clari.tw.science
clari.tw.science+space
misc.education.science
sci.space.science

k12.lang.art
alt.usage.english
misc.education.language.
english

k12.ed.business
alt.business.misc
biz.clarinet.webnews.biz
clari.biz.currencies
clari.biz.economy
clari.biz.stocks.report.usa
clari.biz.world_trade
misc.consumers
misc.transport.trucking
misc.entrepreneurs
gcfreenet.business.small

alt.business.hospitality
clari.biz.industry.travel+
leisure
clari.industry.food
rec.food.equipment
rec.food.historic
rec.food.recipes
alt.creative-cook
alt.food.chocolate

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Mailing Lists

Like the Usenet Newsgroups, mailing lists allow Internet users who share an interest to participate in a discussion group. What are the differences? Fewer mailing lists are available; they are not listed neatly in one place for you to pick from; and you can only "chat" on one if you ask to subscribe and are accepted.

How Mailing Lists Work

A software program (a *listserver*) receives all messages sent to the list and redistributes them to all the subscribers. Each mailing list has two addresses: one where you send a message asking to subscribe; the other where (once accepted) you send messages to be redistributed. (You can always tell a rookie when you open the mailing list messages and find one focused not on the subject but, instead, asking to subscribe.)

VOCNET

One mailing list relevant to teachers of vocational education and applied academics is VOCNET maintained by the National Center for Research in Vocational Education at Berkeley. To subscribe, send an e-mail message to <listserv@cmsa.berkeley.edu>. The message should read (no more, no less):

subscribe vocnet *yourfirstname yourlastname*

Once the moderator tells you you've been accepted, VOCNET will become one of your subscription newsgroups. You will receive all messages sent to the group and can reply or initiate your own messages. When you are within that listserv newsgroup and click REPLY or MAIL, these messages will be automatically addressed to the second mailing list address: <bit.listserv.vocnet>.

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Internet Access

To access the Internet, you will need equipment, software, and an account.

- ***Equipment.*** Basic equipment includes a computer and a modem (a device for allowing your computer to connect to other computers over the phone lines).

One caution about computers: As more and more Websites are built that are graphically sophisticated or that contain access to huge catalogs, you will need a computer with enough speed and memory to deal with it. Older machines with minimal memory are prone to freeze up, shut down, or send error messages when you try to access a site with more content than your computer can handle. You can *download* (move the content from the Website to your own computer) a great deal of material—even movies and videos—if you have the equipment capability and the time.

- ***Software.*** You will also need communication software for the various functions (e.g., Netscape Navigator, Eudora, Trumpet Newsreader). Some software can be downloaded free of charge once you have gained access.
- ***Account.*** Next you need a phone number for your modem to call to establish contact.
  - ✓ If you are taking courses at a university, you may have an Internet account through the university. Or your school may provide Internet access.
  - ✓ If not, you will probably have to subscribe to a commercial online service, either national (e.g., America Online, CompuServe, Prodigy) or local. Service providers will charge you either a flat monthly rate or a base rate plus additional for extra usage.
  - ✓ Freenet may also be available (check your local library for information), but its low-end technology provides text only, so it is not recommended for someone who wants a friendly graphical environment.

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Mega-Websites . . .to Take You Almost Everywhere You Want to Go

One of the easiest ways to access educational materials on the Web is to use one of the Mega-Websites especially designed to link people to key educational sites. Several such sites are described below.

AskERIC
<http://ericir.syr.edu>

→ AskERIC

ERIC (Educational Resources Information Center) is the national educational information system sponsored by the U.S. Department of Education. AskERIC is an awesome link to those resources. The Homepage lists six topics from which to choose: About AskERIC, Question & Answer Service, Virtual Library, New and Noteworthy, Research & Development, and ERIC Database Searches.

If you select the AskERIC Virtual Library, you will get ten more choices:

- ***AskERIC Toolbox***—Provides links (*gateways*) to educational sites, Internet project resources, cool sites for kids, and Internet search tools and training resources. Want to see the Homepage for the CIA, Library of Congress, National Science Foundation, NASA Spacelink, Smithsonian, or PBS? Simply click on the entry. Many of the sites you will want to use are listed here—one-stop shopping. If you want a site that's not listed, search engines for looking further are also provided. If you're having trouble using the Internet, you'll find Internet training sites here to help you.
- ***AskERIC Infoguides***—Provides access to an extensive list of Infoguides on such subjects as chemistry resources, earthquakes, earth science, the environment, weather, grammar instruction, teaching Shakespeare, education software, freeware, Internet resources, and portfolio assessment.
- ***AskERIC Lesson Plans***—Links users to lesson plans submitted to the ERIC database and highlights new plans each month. Also provides links to other online sources of lesson plans.

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- ***Special Projects***—AskERIC works with several organizations, supporting their efforts in providing education information over the Internet. Current special projects include the Gateway to Educational Materials (GEM), Virtual Reference Desk, Consortium for School Networking (CoSN), Cross A K-16 American History Curriculum, Newton's Apple Educational Materials, Chinese Historical and Cultural Project (lesson plans), and NASA SIR-C Education Program (SIR-CED).
- ***Education Mailing List Archive***—Pick a mailing list of interest to you from this listing (e.g., VOCNET) and you will find a list of articles posted to the group, arranged by year, then month.
- ***ERIC Resources***—Allows you to search the ERIC database and the materials developed by ERIC staff (digests, bibliographies, etc.).
- ***ERIC Conference Calendar***—Lists education-related conferences available each month. Information provided includes conference site, sponsor, date, location, topics, and intended audience.
- ***Television Series Companion Materials***—Provides access to educational resources (including lesson plans) produced by various networks (PBS, CNN, C-SPAN, ABC, CBS, Discovery Channel), some of which are designed to be used in conjunction with their programming.
- ***More Educational Resources***—Links to organizational resources such as the U.S. Department of Education, National Library of Education, Regional Educational Laboratories, Vocational Education Resources, National Service Learning Clearinghouse, and Instructional Technology Resources.
- ***Professional and Commercial Announcements***—Provided as a service to AskERIC users, these announcements carry no intention of endorsement.

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Kathy Schrock's Guide for Educators
<http://discoveryschool.com/schrockguide>

→ Kathy Schrock's Guide for Educators

This site is massive—but so well organized and so user-friendly that the size seems manageable. It is updated daily and has won so many awards that it takes two pages just to list them. Sections of interest include links to business sources and grants, entertainment and travel, Internet information, literature and language arts, mathematics, news sources and magazines, reference sources, science and technology, vocational education, and Website evaluation tools.

The Cornell Theory Center
<http://www.tc.cornell.edu/Edu>

→ The Cornell Theory Center

This site provides links to resources for K-12 educators and students through three gateways. The Arts & Social Sciences Gateway includes resources in language arts, foreign languages, fine arts, economics, social studies, and history. The Math & Science Gateway provides links to resources in subject areas such as astronomy, biology, chemistry, computing, the environment, health, mathematics, and physics. A page of links to science and art museums is also available. The Gateway for Educators contains links to information on curriculum, lesson plans, software for the classroom, Internet guides and reference materials, and how to set up Web servers in the schools. Links to other K-12 collections on the Internet are also provided.

TeacherLINK
<http://www.teacherlink.usu.edu>

→ TeacherLINK

TeacherLINK is an online teacher resource center provided as a service to public education by Utah State University's College of Education, the Educational Resources and Technology Center, and the NASA Educator Resource Center. It includes teacher resources (links, lesson plans, pictures, software, etc.) and links to extensive NASA resources and opportunities for public educators. Its subject area index includes topics such as business and finance, clip art and Web graphics, language arts, library and reference resources, math, Nathan's GIANT TeacherLINKS list, links to online media (newspapers, magazines, e-zines, and journals), science, space and aeronautics, and weather.

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→ Vocational Education Resources

Provides extensive gateways to sources for general information about vocational education, curriculum resources for vocational education, school-to-work/tech prep, research in vocational education, federal government information on vocational education, legislation on vocational education, publications for vocational education, higher education and public school resources within vocational education, international interests in vocational education, career and job information in vocational education, and training in vocational education.

Vocational Education Resources
<http://pegasus.cc.ucf.edu/~sorg/vocation.html>

→ NOICC Homepage

The Homepage of the National Occupational Information Coordinating Committee provides access to a wide range of workforce and career development information and resources, including job search sites, career information, career development guidance and counseling, labor market information and education sites, SOICC (state-level) sites, a calendar of events, and NOICC/SOICC initiatives, resources, and activities.

NOICC Homepage
<http://www.state.ia.us/government/wd/noicc>

Other Mega- and Mini-Sites

Academic Innovations: Hot Sites and Ideas
<http://www.academicinnovations.com>

BellSouth Education Gateway
<http://k12.bellsouth.net>

Busy Teachers' WebSite K-12
<http://www.ceismc.gatch.edu/busyt/k12wel.html>

The Chalkboard: A Classroom Corporate Connection
<http://www.thechalkboard.com>

Classroom Connect
<http://www.classroom.net>

CoolSchool
<http://coolschool.edu>

Education Central
<http://www.geocities.com/Athens/Oracle/1201/main.html>

Education World
<http://www.education-world.com>

Individual sites may contain--

Chat rooms

Clipart

Electronic texts

Glossaries

Histories & Biographies

Lesson plans

Links to other sites

Links to search engines

Reference tools

Searchable databases

Virtual factories

Virtual field trips & tours

Worksheets & forms

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Federal School-to-Work Homepage
<http://www.stw.ed.gov>

Federal Resources for Educational Excellence
<http://www.ed.gov/free>

Gateway to Educational Materials (GEM)
<http://www.thegateway.org>

Internet Connections: Lesson Plans and Activities
<http://www.mcrel.org/resources/links/lesson.asp>

Lesson Plan Links
<http://edcen.ehhs.cmich.edu/~tvantine/edlesson.html>

LiveText
<http:// www.ilt.columbia.edu/k12/livetext/index.html>

Miami-Dade Curriculum Connections
<http://www.dade.k12.fl.us/curriculum>

PedagoNet
<http://www.PedagoNet.com>

Real Kids Teacher's Lounge
<http://www.realkids.com/lounge.htm>

Teachers.Net
<http://www.teachers.net>

Teachers Network
<http://www.teachnet.org>

Teachers' Pet Pages
<http://www.geocities.com/Athens/Forum/6727>

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Discipline-Specific & General-Reference Websites

The following is just a sampling of the types of sites you may find through general searches and use of the mega-sites. Again, bear in mind that a single Mega-Website such as Kathy Schrock's may provide organized links to many, if not most, of these sities. Thus, you would need to save (*bookmark*) the URLs for only one or two Mega-Websites rather than for dozens and dozens of smaller sites.

Business & Management Cluster

Accounting Resources on the Internet
<http://raw.rutgers.edu/raw/internet/internet.htm>

Better Business Bureau
<http://www.bbb.org>

Biz/ed
<http://bizednet.bris.ac.uk:8080>

Bplans.com: Planning Resource for Small Businesses
<http://www.bplans.com>

Bureau of Labor Statistics Selective Data Access
<http://www.bls.gov/sahome.html>

Business & Commerce
<http://galaxy.tradewave.com/galaxy/Business-and-Commerce.html>

Business & Technology Education
<http://www.biddeford.com/brhs/Bus.html>

Business Education & Economics Links
<http://www.li.net/~ndonohue/bus.html>

Business Education Department
<http://www.ecnet.net/users/gdlevin/bized.html>

Business Education Lesson Plans and Resources
<http://www.angelfire.com/ks/tonyaskinner/index.html>

Business Education Links
<http://www.dct.com/~franklin/busin.html>
<http://www.idcnet.com/~cstewart/elnkbuse.htm>
<http://www.kane.k12.il.us/Links/BusEducLinks.html>

Business Education Resource Consortium
<http://www.BusEd.org>

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Business Education WWW Sites
<http://www.thomson.com/swpco/bus_ed.html>

Business Law & Personal Finance
<http://www.law.indiana.edu/law/bizlaw.html>

Consumer Education for Teens
<http://www.wa.gov/ago/youth>

CPA Online: Online Source for Accounting Software
<http://www.caponline.com>

Economics Education
<http://www.frbsf.org/econedu/index2.html>

Favorite Business Education Sites
<http://nde4.nde.state.ne.us/BUSED/favsites.html>

Great Ideas for Teaching Accounting
<http://www.swcollege.com/vircomm/gita/gita.html>

Internal Revenue Service
<http://www.irs.gov>

Investor Education
<http://www.vanguard.com/educ/inveduc.html>

Links to Learning Business
<http://www.bright.net/~dgarman/business.htm>

Madalyn: A Business Research Tool
<http://www.udel.edu/alex/mba/main/netdir2.html>

Merrill Lynch Family Saving Center: Teacher's Page
<http://www.plan.ml.com/family/teachers/index.html>

Nasdaq Web Site
<http://nasdaq.com/welcome.htm>

National Fraud Information Center
<http://www.fraud.com>

National Income & Products Accounts
<http://www.lib.virginia.edu/socsci/nipa>

National Institute for Consumer Education
<http://www.emich.edu/public/coe/nice/nice.html>

PC Quote Online
<http://www.pcquote.com>

U.S. Chamber of Commerce
<http://www.uschamber.org>

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U.S. Postal Service
<http://www.usps.gov>

Virtual Consultant: Searchable Business Databases
<http://www.inc.com/virtualconsult/databases>

Fodor's Travel Online
<http://www.Fodors.com>

General Travel Information
<http://www.rhodes.edu/default1htmls/travgen.html>

Preview Travel's Vacation & Cruise Packages
<http://www.preview.travel.com/Vacations>

Recipe Links
<http://www3.hhs.dk/~s00473/reid/links.htm>

Travel Central
<http://www.multitasking.com/travel>

Travel City
<http://www.travelcity.com>

World Travel Guide Online
<http://www.wtgonlin.com>

Science

Bill Nye the Science Guy's Nye Labs Online
<http://nyelabs.kcts.org>

Environment, Health & Safety
<http://www-ehs.ucsd.edu>

Foundations of Science
<http://www.academyonline.com/academy/athens/science/index.htm>

How Things Work
<http://erwin.phys.virginia.edu/Education/Teaching/HowThingsWork>

Mr. Warner's Cool Science
<http://home.unicom.net/~warnerr>

NASA's Quest Project
<http://quest.arc.nasa.gov>

National Energy Foundation
<http://www.xmission.com/~nef>

PBS Online: Science
<http://www.pbs.org/science>

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	Physics-Related Links <http://www.portal.ca/~peterv/nd-phys.html> Science Hobbyist <http://www.eskimo.com/~billb/index.html>
Mathematics	Algebra Activities <http://www.visi.com/~dethier/activities.htm> Geometry Center <http://www.geom.umn.edu> Gomath: High School Math Education <http://www.gomath.com> History of Computing Devices in Mathematics <http://www.llcc.cc.il.us/dbeverid/history.htm> Mathematics Archives: K-12 Internet Sites <http://archives.math.utk.edu/k12.html> Math Forum <http://forum.swarthmore.edu> MathWorld Interactive <http://www.mathworld-interactive.com/whatis.html> Probability Central <http://library.advanced.org/11506/index.html> Spreadsheet Web Site <http://schoolsite.edex.net.uk/323/index.htm> Untangling the Mathematics of Knots <http://www.cs.uidaho.edu/~casey931/mega-math/workbk/knot/knot.html> Virtual Library: Mathematics <http://www.bergen.org/AAST/Virtual_Libary/bmath.html> <http://www.math.fsu.edu/science>
Science & Math	Cornell University Math & Science Gateway <http://www.tc.cornell.edu/Edu/MathSciGateway> Education Links–K12–Math/Science <http://www.fif.org/edulinks/masci.htm>

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Eisenhower National Clearinghouse for Mathematics & Science Education
<http://www.enc.org/nf_index.htm>

Links to Selected Resources
<http://www.gene.com/ae/RC>

NSTA Science & Math Links
<http://www.nsta.org/onlineresources/links>

SciEd: Science & Mathematics Education Resources
<http://www.-hpcc.astro.washington.edu/scied/science.html>

Seaborg Center for Teaching & Learning Science & Mathematics
<http://seaborg.nmu.edu>

Science Service
<http://www.sciserv.org>

TERC: Hands-on Math & Science Learning
<http://www.terc.edu>

Communications/English

Author Webliography
<http://www.lib.lsu.edu/hum/authors.html>

Bartlett's Familiar Quotations
<http://www.columbia.edu/acis/bartleby/bartlett>

English Teachers' Web Site
<http://www.mlckew.edu.au/english>

English Teaching in the UK
<http://www.gosford-hill.oxon.sch.uk/etuk/etuk.htm>

Focusing on Words
<http://www.wordfocus.com/index.html>

Guide to Grammar and Writing
<http://webster.commnet.edu/hp/pages/darling/original.htm>

Hamlet Home Page
<http://www.hamlet.edmonton.ab.ca>

Internet Haiku Salon
<http://mikan.cc.matsuyama-u.ac.jp/~shiki>

Internet Poetry Archive
<http://metalab.unc.edu/ipa>

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Literature E-texts
<http://etext.lib.virginia.edu/english.html>

Middle English E-texts
<http://etext.virginia.edu/mideng.browse.html>

On-Line Books Page
<http://www.cs.cmu.edu/People/spok/aboutolbp.html>

Online Library of Literature
<http://www.literature.org>

On-Line Reference Books for Medieval Studies
<http://orb.rhodes.edu/index.html>

Online Resources for Writers
<http://www.english.uiuc.edu/cws/wworkshop/index.htm>

Outta Ray's Head
<http://www3.sympatico.ca/ray.saitz>

Poetry by Virginia Purchon
<http://www.purchon.co.uk/poetry/index.html>

Shakespeare
<http://www.shakespeare.com>
<http://www.shakespearemag.com>

Word Detective
<http://www.users.interport.net/~words1>

Wordsmyth Dictionary-Thesaurus
<http://www.lightlink.com/bobp/wedt>

Writes of Passage
<http://www.writes.org>

Your Etymology Questions: Origins
<http://bay1.bjt.net/~melanie//arc_logi.html>

General Reference Tools & Links

All-in-One Search Page
<http://www.albany.net/allinone>

Digital Reference Services/Ask an Expert
<http://www.askanexpert.com/askanexpert>
<http://www.vrd.org/Networker2.html>

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Encyclopedia Britannica
<http://www.eb.com:180>

Federal Web Locator
<http://www.law.vill.edu/Fed-Agency/fedwebloc.html>

Fedstats
<http://www.fedstats.gov>

FedWorld Information Network
<http://www.fedworld.gov>

Internet Legal Resources
<http://www.findlaw.com>

Internet Public Library Reference Center
<http://www.ipl.org/ref>

Internet Reference Links
<http://www.library.cornell.edu/okuref/select.htm#news>

Martindale's The Reference Desk
<http://www-sci.lib.uci.edu:80/~martindale/Ref.html>

My Virtual Reference Desk
<http://www.refdesk.com>

Research and Critical Thinking
<http://www.execpc.com/~dboals/think.html>

Southold Free Library
<http://sohd.suffolk.lib.ny.us/main.htm>

Statistical Resources on the Web
<http://www.lib.umich.edu/libhome/Documents.center/stats.html#doctop>

STAT-USA
<http://www.stat-usa.gov>

Study Skills Help Page
<http://www.mtsu.edu/~studskl/#anchor344276>

U.S. Census Bureau
<http://www.census.gov>

WWW Reference Resources
<http://www.library.yale.edu/rsc/readyref>

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Internet Aids

An indispensable resource for teachers using the Internet in the classroom is *From Now On:* The Educational Technology Journal. If you go to <http://www.fromnowon.org>, you can review issues of this e-journal ***online***, or you can subscribe to this free journal and receive a monthly issue by ***e-mail*** from September to June. The articles by the publisher, Jamie McKenzie, are thought-provoking and eye-opening. Be sure to read "Grazing the Net: Raising a Generation of Free Range Students," a delightfully written piece on how to guide students to becoming Internet *infotectives* "capable of asking great questions about data . . . in order to convert the data into information . . . and eventually into insight."

Other Internet aids you might want to check:

Beginner's Help
<http://www.webnovice.com>

Computer Virus Myths
<http://kumite.com/myths>

EdWeb
<http://edweb.cnidr.org>

Evaluating Web Resources
<http://www.science.widener.edu/~withers/webeval.htm>

Internet Navigation Tools
<http://riceinfo.rice.edu/Internet>

Learn the Net: Internet Guide and Tutorial
<http://www.learnthenet.com/english>

Link2Learn Professional Development
<http://L2L.ed.psu.edu>

Website Construction Resources
<http://www.ilt.columbia.edu/k12/livetext/resources/wwwdev.html#design>

Web Lessons
<http://www.polaris.edu/iltli/WEB.htm>

Web Page Construction Tutor
<http://www.bhs-ms.org/webhelp/index.html>

Well Connected Educator
<http://www.gsh.org/wce>

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Additional References

For more information about the Internet, consider consulting some of the following sources:

Glavac, Marjan M. *The Busy Educator's Guide to the World Wide Web.* London, Ontario, Canada: NIMA Systems, 1998

A book written by an educator that emphasizes what the busy educator can use in the class **now**! Chapters include how to use the Internet—real fast; what's behind those links; sites that motivate, engage, and stimulate students (and educators); Internet projects that really work; searching and finding information for the busy educator; and publish or perish: no one knows what you've done until you've told them.

Morris, Evan. *The Book Lover's Guide to the Internet.* Reprint Edition. New York, NY: Fawcett Columbine, 1998.

Contains chapters on what the Internet is and where it came from, simple ways to connect yourself to the Internet, the many paths through the Internet, adding your two cents' worth, participating in mailing lists, publishing online, online resources for book lovers, and staying abreast of new resources on the Internet.

Williams, Bard. *The Internet for Teachers,* 1996.
Jasmine, Grace; and Jasmine, Julia. *Internet Directory for Teachers*, 1997.
Williams, Bard; and Kawasaki, Guy. *Web Publishing for Teachers*, 1997.

Part of the **For Dummies®** series from IDG Books Worldwide (Foster City, CA), these "lighthearted—but not lightweight"—books are clearly laid out, filled with useful tips and hints, and designed to address the particular needs of teachers.

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Tech Prep Curriculum Catalog
<http://www.ohtpcs.org/tpcurr.htm>

The following resources are available to Ohio teachers for 2-week loan from the Tech Prep Collection at the Center on Education and Training for Employment, 1900 Kenny Road, Columbus. Contact Steve Chambers, librarian, by e-mail <chambers.2@osu.edu> or by phone: 614-292-6991; or 800-848-4815, ext. 2-6991.

TP 001 038	*Online Classroom: Teaching with the Internet*
TP 001 039	*The Internet and the K-12 Classroom*
TP 001 062	*Learn How to Use Netscape Navigator* (VHS videotape)
TP 001 076	*Global Quest: The Internet in the Classroom* (VHS Videotape & Computer Software: Mac and Windows versions)
TP 001 077	*Educator's Internet Companion: Classroom Connect's Complete Guide to Educational Resources on the Internet*
TP 001 230	*Education on the Internet: Hands-on Book of Ideas, Resources, Projects, and Advice*
TP 001 231	*Educator's World Wide Web Tour Guide: A Graphical Tour of Over 200 Educational Treasures on the World Wide Web*
TP 001 234	*Teaching & Learning with the Internet: Facilitators Guide*
TP 001 235	*Teaching & Learning with the Internet:, No. 1* (VHS videotape)
TP 001 236	*Teaching & Learning with the Internet:, No. 2* (VHS videotape)
TP 001 277	*Educator's Information Highway*

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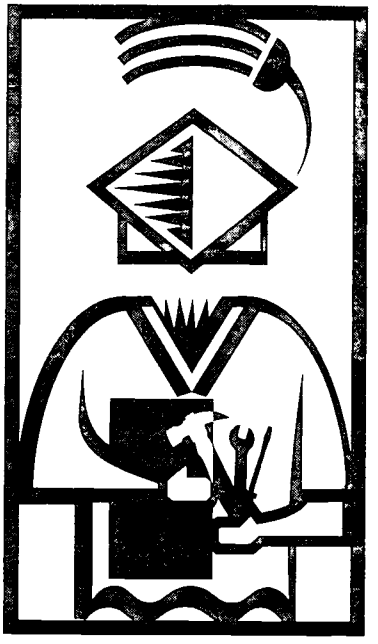


Insert the
"Curricular Resources for
Applied Academics"
Tab Here

Curricular Resources for Applied Academics

Clearly, there are hazards inherent in any resource list. For one thing, no sooner is it developed than it is out of date. Moreover, publications go out of print, may be expensive, or may be hard to find. So, here are some suggestions for using the following resource list wisely.

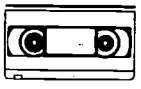
- ***Be aware that business math and business communications are an inherent part of business & management programs.*** Therefore, it is essential that mathematics and English teachers coordinate the use of business-specific texts—or the activities within them—with the business & management teachers to avoid duplication.
- ***Be on the lookout for new materials.*** The resources that follow should be taken as examples of the types of materials that are out there. By contacting the publishers listed—publishers who seem committed to supporting integrated, applied, hands-on instruction—you can easily get an up-to-date catalog of available materials. Information for contacting these publishers via phone, fax, e-mail, or Internet is provided at the end of this section.
- ***Don't ignore older material.*** Just because particular materials are no longer available from a publisher doesn't mean they no longer exist. If you are trying to develop integrated curricula for your program, it can be very useful to have access to a variety of resources, whether they are still for sale or not. Check your school, district, college/university, city, or state libraries for sources of interest on this list.

  You will note that some materials carry a TP #. These are materials that are part of Ohio's Tech Prep Library located at the Center on Education and Training for Employment, 1900 Kenny Road, Columbus. The collection contains over 1,700 items at present, each of which was selected based on reviews by academic and vocational teachers, counselors, and administrators in Tech Prep programs. These materials are available to Ohio educators on a 2-week free loan basis.

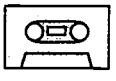
Ohio Tech Prep
Curriculum Services
<http://www.ohtpcs.org>

ERIC/CSMEE
<http://www.ericse.org>

ENC Online
<http://www.enc.org>



Videos



Audiocassettes

Compact discs

Software

- ***Use the CETE library.*** Better still, visit the collection at the CETE library so you can browse. The texts listed in this section focus on applied academics, but the collection also contains a wealth of technical texts. If you are an applied academics teacher wanting to learn more about the occupational areas of your students, there are many excellent texts here that could be of help. What's more, if you are an applied science teacher, the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/CSMEE) and the Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) are located right across the street.
- ***Utilize major and minor publishers.*** The focus of the listing is on sources other than major publishers (although some major publishers are represented). The reasons are several. One is that major publishers do a good job all by themselves of promoting their products in the schools. A second is that the names of and contact information for major publishers tends to be a slippery issue these days. They merge a lot. One day you have Addison Wesley and Longman, the next you have Addison Wesley Longman. If you have access to the World Wide Web, use of a search engine will quickly locate most major and some minor publishers for you, referring you to a publisher's new name and Web address if there's been a change. Many publishers have catalogs online or a button you can click to have a print catalog sent to you.
- ***Watch for icons signalling media other than texts.*** The listing includes videos, audiocassettes, read-only compact discs (CD-ROM) and software. These are represented by the icons shown in the margin.

Please Note: In most cases, the annotations have been drawn from descriptions provided by the developers or publishers, and no endorsement of the products is intended.

Applied Communications, Mathematics, and Science

Career Communications, Inc.

✓ *American Careers*

This **magazine**, produced three times a year, provides content of high interest to vocational students, and its articles lend themselves to use in applied academics classes. In fact, applied math, science, and communications are a focus of the magazine's writers.

For example, students can use the article "Business Careers" as a basis for oral discussion in a communications class. They can use a table on the "Top Metro Areas for Average Pay" as a basis for library research on cost-of-living figures and quality-of-life statistics for the cities listed. They can learn about a communication skill not written about in most school texts: schmoozing.

A table presenting data on 50 fast-growing careers, average salary per year for each, and training needed after high school could be the basis for a variety of math activities. Want students to appreciate the role geometry plays in the world of work? How about an article on unusual careers for people who love shapes—one in which a LEGO® block model builder says, "Just try building a motorcycle wheel or a sphere out of a little square block, and you'll see where the math comes in handy."

Math and science skills needed in the real world are covered in such articles as "Creative Careers That Demand Math and Science Skills," "Calculate the Value of Math and Science Careers," and "What Do Math and Science Have to Do with Life Anyway?"

Ohio Agricultural Education Curriculum Materials Service

✓ *Teaching for Connection: Critical Thinking Skills, Problem Solving, and Academic and Occupational Competencies*
This is an excellent source for vocational teachers wishing to integrate academic competencies and activities requiring critical thinking and problem solving into their lessons. The text begins with a 20-page introduction explaining the text's philosophy, detailing the steps in the lesson development process, and providing a sample lesson plan format. The bulk of the publication, then, comprises sample **lesson plans** from a variety of vocational service areas.

EDINFO Press

✓ *Critical Thinking, Reading, and Writing*
The **practical classroom activities** in this document encourage reading, writing, and thinking in a critically reflective, inventive way for students at all levels and across most subjects. Secondary-level activities include identifying frames of reference; critical reading in relation to newspapers, junk mail, and television; research-oriented writing; and study guides focused on examination of moral issues.

TP 001 043

✓ *Reading and Writing across the High School Science and Math Curriculum*
To counteract the breakdown between scientific thinking and the intelligent use of language, the author compiled a collection of **lesson plans** drawn from tried and tested material in the ERIC database. These lessons help you build good language usage into your already existing science and math curriculum. The plans are grouped into the following topics: writing science, reading science, wording science, short scientific writing assignments, long scientific writing assignments, science and imagination, and analogical reasoning—from science and math to world and ideas, and back again. Math is incorporated within these "science" topics.

TP 001 044

✓ *Writing across the Curriculum Leader's Manual*
This workshop manual presents a writing program designed to be incorporated in all content areas without disrupting teachers' established syllabi or adding significantly to teachers' already heavy schedules and workloads. Leader notes (including discussions of the pertinent literature and answers to the most commonly asked questions), group discussion, activities, and overhead transparencies are arranged sequentially for a step-by-step, page-by-page presentation. The manual is loaded with activities for content-area teachers to try out in the workshop setting. It is recommended that the workshop participants supplement this material with the book *Writing Is Learning* by Howard Willis.

✓ *Writing Is Learning: Strategies for Math, Science, Social Studies, and Language Arts*
Writing is an effective tool for teaching in any content area—and a powerful way to make students active participants in their own learning. Writing **activities** in this document include journals, problem solving, writing "from the future," summaries, narratives, definitions, reviews, and letter writing.

Virginia Vocational Curriculum and Resource Center

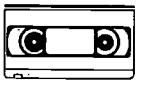
✓ *Collaborative Lesson Plans*
Developed by Virginia teachers, this collection of **lesson plans** provides innovative, challenging ideas for integrating academic (math, science, English, and history/social studies) and vocational disciplines.

Applied Communications

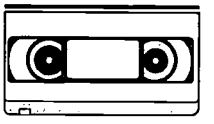
Agency for Instructional Technology (AIT)

Samples TP 000 795-796

✓ *Applied Communication*
Each of the 17 modules in this **package** consist of ten activity-oriented lessons that apply reading, writing, listening, speaking, and problem solving to on-the job situations in five major occupational areas, including business/marketing. Materials in this package include instructor's kit, instructor's guide, worktext, and videocassette. The two sample modules in the Tech Prep collection focus on technical writing and electronic communication.



✓ *Get Writing!*
The five video programs and a workbook in this **package** are designed to develop students' ability to put together clear, concise paragraphs that can be used to complete job applications, write business or family letters, and present reports on the job.



American Management Association (AMACOM)

✓ *The AMA Handbook of Business Letters, 2nd ed.*
Succinct guidelines on grammar and style, plus hundreds of model letters for every business situation, are included in this handbook. In addition, the book's 320 pretyped letters are ready-to-go, or to tailor as needed, by slipping the enclosed diskette into any computer.

✓ *The AMA Style Guide for Business Writing*
A style guide developed exclusively for business writers, this comprehensive resource features guidelines on the full range of business communications, formats, preferred usages, and other issues that arise in the creation of memos, reports, newsletters, and speeches. Information is arranged alphabetically and copiously cross-referenced.

Barron's Educational Series, Inc.

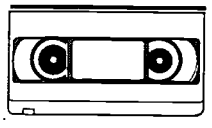
- ✓ *Dictionary of Accounting Terms*
- ✓ *Dictionary of Banking Terms*
- ✓ *Dictionary of Business Terms*
- ✓ *Dictionary of International Business Terms*
- ✓ *Dictionary of Finance & Investment Terms*
- ✓ *Dictionary of Marketing Terms*

These occupational dictionaries could provide the basis for vocabulary development and other applied communications activities.

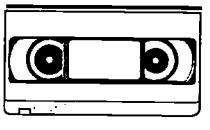
Butterworth-Heinemann

✓ *Dictionary of Travel, Tourism and Hospitality*
Another occupational dictionary that could be used to support occupation-specific applied communications activities.

Cambridge Educational



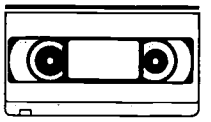
✓ *Constructive Communications: Talking Your Way to Success*
This 30-minute video uses entertaining vignettes to demonstrate a process for effective communication, including how to identify the effect you hope to achieve, understand the knowledge and attitude of the audience, explain your subject with specific and organized information, and see the positive effects of knowing and understanding yourself.



✓ *Effective Listening Skills: Listening to What You Hear*
Listening, which may be the most essential communication skill of all, is the focus of this 30-minute video. Students learn the benefits of listening and master the skills by deciding to listen, reading all stimuli, investing spare time wisely, verifying what they hear, and expending energy.

✓ *Writing for Results: The Winning Written Report*

The importance of good writing skills to job entry and job success is stressed in this 30-minute video. The process presented shows how to analyze your prospective reader; determine the report's purpose; select and narrow the topic; gather, record, and file information; organize the paper; provide concrete and specific supporting material; proofread and revise; and prepare the final product.

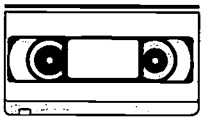


CareerTrack Publications

✓ *Assertive Communication Skills for Professionals*

TP 000 547-551

These four videos, supported by an audio/video workbook, help students learn to communicate powerfully in a style that is comfortable. They define assertive behavior, tell how to build an assertive foundation, introduce the assertiveness toolbox, and explain how to put assertiveness to work. Engaging **role-play vignettes** and **practice exercises** are included.



Communication Briefings

✓ *Everyone's Customer-Service Role*

TP 000 601-610

✓ *Getting the Most Out of Your Meetings*

✓ *Solving People-Problems on the Job*

✓ *Make Presentations Work for You*

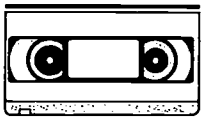
✓ *Communicating with Customers*

✓ *Get More Done in Less Time*

✓ *Communicating with People on the Job*

✓ *Listening: The Key to Productivity*

✓ *Make the Phone Work for You*



A series of videos (average length = 15 minutes) designed to help develop workplace communication skills. Two additional videos not included in the Tech Prep collection cover *Better Business Grammar* and *Mastering Memos.*

Contemporary Books

TP 000 628

✓ *Essential Skills for the Workplace (Level One): Obtaining Information and Using Resources*

Text covers telephone messages, reference materials, policy manuals, charts and tables, product information for selling, product information for purchasing, mileage charts and transportation schedules, shipping and receiving documents, and measurements (e.g., of size and space, weight, pressure, temperature, time, and money).

TP 000 627

✓ *Essential Skills for the Workplace (Level One): Using Forms and Documents*

Text covers personal forms, paychecks, credit, application and training forms, certification and licensing forms, starting a job, time sheets, benefits on the job, order forms, billing forms, contracts and agreements, warranties, and legal notices.

TP 000 618

✓ *Expressions: Stories and Poems*

This collection of 20 unabridged stories and poems showcases a wide range of writing styles for student interpretation.

TP 000 619

✓ *Viewpoints: Nonfiction Selections*

Contains over 20 short pieces of nonfiction (both excerpts and full length) that focus on timely themes such as family relationships, humor, personal freedom, employment, and war.

TP 000 623-624

✓ *Communication Skills That Work: A Functional Approach for Life and Work*

Book One covers giving and following directions; gathering information; stating a viewpoint; writing labels, lists, and notes; and filling out charts and forms. Book Two covers listening and speaking effectively, asking questions and giving directions, interviewing techniques, and writing memos and business correspondence.

✓ *Reading Skills That Work: A Functional Approach for Life and Work*

TP 000 621-622

Book One covers building vocabulary, interpreting graphics, following directions and procedures, skimming and scanning for information, and developing reference skills. Book Two covers interpreting and summarizing written materials, evaluating information and drawing conclusions, classifying and prioritizing information, researching a task, and working and problem solving as a team.

Curriculum and Instructional Materials Center—Oklahoma

CIMC's English series was designed to reinforce basic skills concepts through practical exercises and practice. Emphasis is placed on functional literacy. Titles include the following:

✓ *English: Volume II*

Contents provide related vocational information, employability skills, personal development, writing skills, parts of speech, library skills, practical usage, and life skills. Text is supported by **36 transparency masters**, **3 job sheets**, and **144 assignment sheets**.

✓ *Parts of Speech*

Text covers nouns, pronouns, conjunctions and interjections, prepositions, adjectives, and adverbs.

✓ *Introduction to Writing*

Contents focus primarily on the writing of sentences. Text is supported by **24 assignment sheets**.

Delmar Publishers

✓ *Communicating in Business and Industry, 2nd ed.*

TP 000 020

Designed to help students master the verbal and nonverbal communication skills essential for success in modern business and industry settings. Covers reading, writing, listening, telephone, and computer skills, as well as such topics as fax and cellular communication, desktop publishing, time management, and innovative problem solving.

Glencoe/McGraw-Hill

TP 001 184-185

VT 040 708

✓ *Developing Proofreading Skill: With Editing Applications*
This program presents progressively more difficult proofreading problems, with end-of-chapter applications dealing with real-world settings and documents. A data disk correlated with the chapter sequence includes memos, letters, and other documents for proofreading.

✓ *Editing and Proofreading*
Includes a student workbook and teacher's annotated edition focusing on fundamental editing and proofreadng skills.

✓ *Gregg Reference Manual*
Although the publisher insists on listing this text only in its Business Reference Texts—rather than English Texts—section, it is in fact the single best reference for grammar, style, and usage questions that this writer/editor/former English teacher has ever encountered. This is the handbook that is always at my fingertips. The explanations of the "rules" are simple and clear, each supported with very helpful samples of right and wrong. The index is extensive, allowing you to find the rule you want. Contents cover punctuation; capitalization; numbers; abbreviations; plurals and possessives; spelling; compound words; word division; grammar; usage; editing, proofreading, and filing; letters and memos; reports and manuscripts; notes and bibliographies; tables; other business documents; and forms of address. Glossaries present grammatical terms and computer terms. Two **supplementary volumes of worksheets** are available to provide students with practice in applying the rules.

✓ *Writer's Choice: Composition and Grammar Series (9-12)*
The communication skills of writing, speaking, listening, and thinking are integrated in this text. Case studies that show how writers handle real-life writing projects are provided to give students a chance to role-play, think critically, and write. Each composition lesson ends with a full page of guided, cross-curricular, and open assignments, allowing for varying levels of self-direction. Each grammar, usage, and mechanics unit ends with a *Workshop* feature, which reinforces the relationship between these topics and the worlds of writing and literature. Literature selections in each composition unit reflect the quality and diversity of professional writing today.

Goodheart-Wilcox

✓ *Successful Technical Writing*
Proper procedures for producing effective business documents are the focus of this text. Memos, various types of reports, letters, operation manuals, owner's manuals, executive abstracts, and proposals are among the topics covered.

Great Source, Houghton Mifflin

✓ *Oxford School Shakespeare*
Each of the 14 plays in this series includes the complete and unabridged text of the play, as well as all the tools students need to understand it. Extensive notes included alongside the text provide detailed explanations of difficult words and passages, plot synopses, summaries of individual scenes, and character notes. Also included are biographical information on Shakespeare, historical background of England during Shakespeare's time, character studies, and projects.

✓ *Practical Approaches to Teaching Shakespeare*
This teacher's resource offers practical, easy-to-implement suggestions for games, exercises, music, and art to make Shakespeare more accessible and enjoyable.

TP 000 412

✓ *Writer's INC: A Student Handbook for Writing & Learning*
A stunning paperback book (in this writer's opinion) that supports integration at a variety of levels. Instead of separate grammar, literature, speech, and composition texts, this book blends it all under one cover, producing a true ***handbook*** for students as they work on their communication skills across subjects. The major sections address the writing process, basic elements of writing, searching and researching, forms of writing, writing about literature, reading and study skills, and speaking and thinking.

These are further supported by a *Proofreader's Guide* to grammar and style and an *Almanac* with full-color maps, traffic signs, periodic table of elements, U.S. Constitution, parliamentary procedures, multiplication and division tables, weights and measures, metric system, planets, U.S. Presidents and Vice Presidents, and historical time line.

There are no traditional assignments or exercises. Instead, this is a "portable" guide to students' own writing and learning. The instruction is supported with lots of actual good and bad examples of writing—some from well-known authors, some from published works by student writers. A teacher's guide is available to support use of the text.

✓ *Writer's INC. School to Work: A Student Handbook*
This is very much like the handbook described previously, with the same rigor, but the writing samples focus more on workplace writing and speaking and less on creative writing. Major topics include the communication process; the writing process; basic elements of writing; forms of writing; writing in the workplace; research writing; searching for information; speaking and listening; issues in the workplace; and reading, thinking, learning.

✓ *Daily Language Workouts*

This flexible teacher's resource includes **high-interest language activities** designed to help students develop their editing and proofreading skills. The activities are short and fun, take only a few minutes of class time, yet pack a lot of punch. They can be used for oral or written practice to pump students up for effective communication. Activities include daily *MUG Shots* (sentences containing language blunders in ***m***echanics, ***u***sage, and ***g***rammar for students to identify and fix); weekly *MUG Shot Paragraphs* to edit; daily writing practice activities in which writing prompts (photo, quote, graphic) inspire free writing on a variety of topics; sentences for modeling and expanding, penned by well-known writers; and show-me sentences, which give students starting points for writing strong, active sentences.

✓ *Writer's Express: A Handbook for Young Writers, Thinkers & Learners* TP 000 475

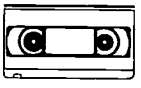
This text covers everything from the writing process to historical documents, from study skills to writing riddles, from speaking and listening to solving word problems. Although designed for the middle-school level, these materials could be used for students who need more-extensive remediation.

✓ *Writer's Files: Grades 9-12* TP 000 476-479

The Writer's File for each level provides a sequence of **reproducible writing and language activities** that can serve as the focus of a new and stimulating writing program when used in conjunction with *Writer's INC* or as a supplement in an existing program. Provided for each level are 18 "sequential" writing activities; 50 or 60 writing workshops; over 200 daily language activities; and numerous reproducible forms, strategies, and resources.

Lakeshore Learning Materials

Lakeshore Basics & Beyond materials are designed for students who are hard to reach, at risk of dropping out, or in need of a fresh approach to learning. If you have students in need of remediation or if you have students who could benefit initially from materials written at a lower (or controlled) reading level with a high interest level, Lakeshore may be a good source for you. Some examples of **videos**, **worktexts**, **texts**, and **game/activity books** that could be of interest follow.



- ✓ *201 Ready-to-Use Word Games for the English Classroom*
- ✓ *Better Writing for Better Jobs Worktext*
- ✓ *English Ideas That Really Work*
- ✓ *English Teacher's Book of Instant Word Games*
- ✓ *How to Write Sentences Video Program*
- ✓ *A Picture Is Worth 1,000 Words: Story Starters*
- ✓ *Real-Life Communication at Work*
- ✓ *Standard English Video Activity Program*
- ✓ *Take the Fear Out of Shakespeare*

  Facing pages present Shakespeare in the original version and in modern translation. The ten plays in this series are available as a set or individually.

NCRVE–Berkeley

- ✓ *Novels and Short Stories About Work: An Annotated Bibliography*

  This annotated bibliography lists novels and short stories from English, American, and international literature that deal with work and suggests ways to incorporate work literature into the classroom. ERIC: ED 352 556

Paradigm Publishing, Inc.

TP 000 691-692

- ✓ *Business Writing: Integrating Process and Purpose, 5th ed.*

  Teaches learners to focus on both the process and purpose of writing as they develop business documents, to pass on information, to respond to requests and questions, to request information or action, to direct, to persuade, and to sell self.

✓ *Proofreading & Editing Business Documents, 2nd ed.*
Teaches how to locate and correct three types of errors—format errors or inconsistencies; typographical errors; and meaning, or content, errors—in short business documents, longer reports, and graphic-oriented pages or documents. Also covers light editing often associated with proofreading. Each chapter includes specific techniques, associated language/grammar skills, and a **performance test**. (Text and Instructor's Guide)

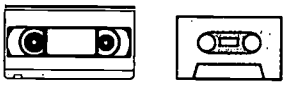
TP 000 794 and 799

✓ *Reading for Workplace Success: General Business*
Teaches reading strategies and skills to prepare learners for problems they will encounter in training programs and on the job. (Text and Instructor's Guide)

TP 000 683-684

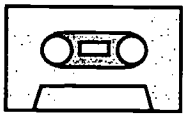
✓ *Telephone Mastery: Skills for Business Productivity*
Teaches effective use of the telephone, stressing listening techniques, attitude, and voice control. Includes a **performance checklist** that can be used for student self-evaluation. The **package** includes text, instructor's guide, video, study guide, and six audiocassettes.

TP 000 736-745



✓ *Telephone Techniques: Building Communication Skills*
This set of six audiocassettes, supported by an accompanying study guide, includes 22 activities focusing on voice, word, and listening power.

TP 000 739-745



✓ *Writing for Workplace Success*
Develops students' abilities and knowledge of writing within a business and occupational context through problems set in an authentic workplace environment. The four units cover passing on information, responding to questions and requests, making requests, and reporting information. (Text and Instructor's Guide)

TP 000 687-688

✓ *Writing in the Information Age: A Sales and Marketing Approach*
Uses sales and marketing concepts to teach critical writing skills and tools within a context of effective practical techniques and activities. (Text and Instructor's Guide)

TP 000 689-690

Prentice Hall

✓ *Webster's New World Dictionary of the Culinary Arts*
This occupational dictionary could provide the basis for vocabulary development and other applied communications activities.

Procter & Gamble Educational Services

✓ *Public Relations Guide*
Although written to help teachers and others to use public relations techniques on behalf of their organizations and programs, this guide (available free of charge and reproducible without permission) could easily be used with students in lessons focusing on communication through promotion and advertising. It provides basic information about the role, purpose, and functions of public relations so that readers will be able to develop and implement their own public relations plans. **Samples**, a **glossary** of terms, and lists of **public relations resources** and additional sources of information support the text.

✓ *Advertising and the Economy*
This 32-page classroom teaching guide includes a profile of advertising's history and its role in the economy, eight **reproducible lessons** on advertising and the economy, **teaching tips** for each lesson, a full-color **poster** depicting advertising's evolution, and a **video guide**. Although focused on economics, the materials could easily be adapted for use in communications classrooms where the focus would be on writing to sell and recognizing the propaganda techniques used in advertising.

South-Western Educational Publishing

✓ *American Literature for Life and Work*
✓ *British & World Literature for Life and Work*

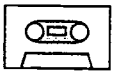
These anthologies group the literature offerings into high-interest, relevant topics (e.g., community and responsibility, innocence and experience, choices and possibilities). Each grouping is followed by assignments requiring students to explore, understand, and connect. Students are invited to express their own views, share them with others, work on teams, and make a significant difference in the community. The lessons emphasize practical writing for the real world—meeting the high standards of business, working collaboratively. *Workshops* at the end of the text give students practice in moving from school assignments to workplace tasks.

✓ *The Art of Life: An Anthology about Life and Work*
✓ *The Art of Work: An Anthology of Workplace Literature*

These anthologies contain a collection of high-interest, quality readings linked to the Applied Communication curriculum. The contemporary and classical selections cover all genres and are balanced for multicultural and gender equity.

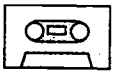
✓ *Communicating for Success: An Applied Approach*

Three of the authors of this text hail from Ohio's Great Oaks Institute of Technology and Career Education. Lessons are not structured around traditional topics such as nouns, verbs, etc. Instead grammar, punctuation, and usage are addressed when they are important to a specific job-related task. In every chapter, students have a chance to practice language skills tied to the tasks in which they are used in business and industry. Each chapter is arranged as follows: introduction, warm-up exercise, practice, and project. Once a skill has been introduced, it is not forgotten; its use is woven throughout subsequent chapters. Chapter topics include communicating at work, communicating definitions, listening and responding, giving instructions, describing a process, describing a mechanism, summarizing, completing forms, communicating messages (memos, letters, and notes), persuading, applying for a job, comparing and contrasting, interviewing for information, using numbers and statistics, presenting reports, and becoming a professional.



✓ *Communication 2000*

The 14 modules in this totally flexible, multimedia system cover workplace communication, listening and speaking, workplace writing, information in the workplace, reading in the workplace, self-management, negotiation to solve problems, communicating with co-workers, communicating with customers, communicating with teams, diversity in the workplace, ethics in the workplace, technical communication, and effective presentations. Learner and instructor guides are supported by an interactive videodisc or videocassette, audiocassettes containing literature readings and related activities, and template discs containing files for student activities.



✓ *Communication for Business and Marketing Careers*

Applies the successful communication topics explored in Communication 2000 to a specific career cluster, with career-specific applications throughout each lesson. Video segments include documentary "on the job" footage and interviews. An audiocassette provides listening activities to prepare students for a career environment. Selected lessons encourage students to surf the Internet for job search activities.

✓ *Communication Skills for the Processing of Words*

In addition to providing students with a firm base in the language arts, this text-workbook helps students develop the decision-making skills necessary for success in today's offices. Realistic application materials address such business-related topics as stress, business ethics, listening skills, office technology, management skills, quality circles, and computer information. Cumulative exercises and assignments require students to apply the principles taught as they prepare typical business communications.

✓ *Reading for Success: A School-to-Work Approach*
This text uses an array of contemporary "how-to" and technical print materials to stimulate students' interest in becoming better readers of both textual and graphic materials.

✓ *Speaking for Success*
Whether talking person to person, in a group, or in front of an audience, students will get plenty of hands-on experience in effective communication using this text. Each chapter offers numerous applications and workshops, with a variety of career connections; readings, quotes, and famous speeches; **workplace cases** for discussion and evaluation; individual and group speaking assignments; model speeches and outlines; and **practice activities**. An instructor's manual, PowerPoint disk, and video supplement the text.

✓ *Technical Writing for Success: A School-to-Work Approach*
Both technical writing and technical reading are included in this engagingly written and highly practical book. Workplace competencies are built into each chapter, and a diskette provides additional reinforcement activities.

✓ *Word Processing Activities to Build Communication Skills*
This text-workbook reinforces students' English skills using their previous experience with word processing, spreadsheets, databases, telecommunications, and the Internet. Activities included become progressively more difficult, with fewer instructions, in order to provide students with the opportunity to improve their critical thinking skills. Includes a template disk containing data files to save keying time.

USA TODAY

Although the following sources aren't "applied communications" per se, they would be a rich resource for providing content that vocational students could use as the basis for assignments involving reading, writing, speaking, and/or discussion.

✓ *Business Today*

Developed in cooperation with Future Business Leaders of America, this guide supports the use of *USA TODAY* as a real-world text in learning key business concepts from the national and international business world.

✓ *Careers: A Lifetime Journey*

Developed in cooperation with the National Career Development Association and the Department of Labor, this career education program provides educators with real-world tools and information to assist students in lifelong career planning. Leads students through self-assessment activities and introduces them to role models.

✓ *Today's Issues*

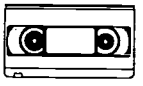
Developed in cooperation with the National Education Association, the activities in this program use *USA TODAY* to address the critical issues facing today's teens and to reinforce critical thinking, decision making, cause-and-effect analysis, and goal planning.

Applied Mathematics and Science

Curriculum Publications Clearinghouse— Illinois

✓ *Phys-Ma-Tech*

To encourage students who do not traditionally enroll in physics to do so, these **activity-based materials** integrate the academic content of three disciplines—physics, math, and technology—and relate it to real-world experiences. The materials—which are designed to improve high school physics without diminishing the content or rigor of the subject—expose students to a variety of technological devices, systems, and processes. The activities have been tested and can be used, adapted, or expanded for use in a variety of teaching contexts. A videotape is available to support the print materials.



Glencoe/McGraw-Hill

✓ *Technology: Science and Math in Action*

Two Student Activity Texts, each containing five modules, present **hands-on activities** in which students use scientific and mathematical concepts to solve technological problems. Students do experiments, complete activity sheets, and design and build products. Career information and the history of technology are included. Topics include hydroponics, bridges, printed images, rockets, electricity, recycling, and videos.

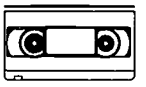
✓ *Technology, Science, and Mathematics Connections Activities: A Teacher's Resource Binder*

Each activity in this Teacher's Resource Binder provides a technological problem to be solved and describes the technology, science, and mathematics applications students will use. The technology component provides guidance for designing, constructing, and evaluating a product. The science and mathematics components are related to the product and to **real-world problems and situations**. Math topics are correlated to NCTM standards. Topics include pollution-free vehicles, power boat, robotic transfer, and rocket payload.

Applied Mathematics

Agency for Instructional Technology (AIT)

✓ *Mathemedia*
This multimedia **package** (videos or laserdiscs, software, teacher's guide, and student guide) is designed to increase students' understanding of mathematics using context-based, problem-solving activities recommended by NCTM. *Mathemedia Software* links students to spreadsheet mathematics featuring real-world examples students can solve on the computer, while also learning the principles these problems demonstrate.

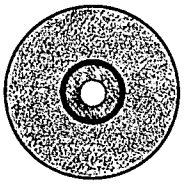


Association for Career and Technical Education (ACTE)

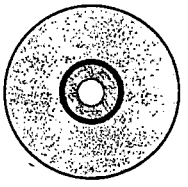
✓ *Math . . . Who Needs It?*
Join host Jaime Escalante and guests Bill Cosby, Dizzy Gillespie, and Teri Garr on a wild ride through some of math's coolest **real-world applications**. Students will see that math can be accessible and fun, and that it's essential to everything from designing skateboards and roller coasters to sports and music careers.

Cambridge Educational

✓ *Multimedia Reading a Ruler: English and Metric Measurements*
Includes the basics of inches, feet, yards, halves, quarters, eighths, and sixteenths; the steps in calculating simple and compound fractions using the ruler; and a drill and practice in reading a ruler including simple and compound fractions. The metric instruction covers the same topics but using the metric system. Available on CD-ROM for IBM and Macintosh. Includes videos, audio, still photos, illustrations, animation, text materials, interactive lessons, and reproducible quizzes.



Center for Occupational Research and Development (CORD)



✓ *Math at Work*

This interactive CD-ROM series features student-appealing businesses in which correct calculations help students win the race, earn more money, construct a pool, assist smokejumpers to safety, and clean up a hazardous fuel spill at a train derailment. Each workplace module in the series has multiple scenarios and difficulty levels. A rich context and real-world connections help all students learn.

Contemporary Books

TP 000 611

✓ *Math Problem Solver: Reasoning Skills for Application*

Text emphasizes translating word problems into mathematical language.

TP 000 625-626

✓ *Math Skills That Work: A Functional Approach for Life and Work*

Book One covers working with whole numbers and money; sorting and filing numerically; writing checks; filling out receipts, purchase orders, and forms; balancing checkbooks; and interpreting paycheck stubs. Book Two covers using decimals, fractions, and percents; reading thermometers, rules, scales, and gauges; interpreting graphs and data; calculating commissions and interest; determining unit prices and extended costs; and understanding budgets and schedules.

TP 000 613

✓ *Number Power Review*

Text covers from whole numbers to algebra, and prepares students to take—and pass—standard math assessment and competency exams.

Cuisenaire♦Dale Seymour Publications

- ✓ *Data-Driven Mathematics Series*
  In this series of modules, the authors have taken the core ideas from the high school mathematics curriculum and found ways to explore, teach, and apply that content through the use of statistical analysis techniques and principles. Extensive **use of real data** provides opportunities for students to engage in meaningful mathematics and motivates them to apply what they learn.
- ✓ *Graphing Calculator Activities*
  This book contains **35 reproducible activities** for studying the graphs and functions encountered in Algebra I and II, including graphing lines, inequalities, roots, and hyperbolas.
- ✓ *When Are We Ever Gonna Have to Use This? 3rd ed.*
  Although this 1988 book by Hal Saunders appears to be out of print, you may be able to find a copy in a school or public library. As the title suggests, the author—a high school mathematics teacher—created a book designed to answer the question of how mathematics skills apply to the real world in which students live.

Curriculum and Instructional Materials Center—Oklahoma

CIMC's Mathematics series emphasizes applied practice. Each instructional package is specifically oriented toward students pursuing vocational training and is supported by assignment sheets. Titles include the following:

- ✓ *Whole Numbers*
- ✓ *Fractions*
- ✓ *Measurement*
- ✓ *Decimals and Percents*
- ✓ *Geometry*

Delmar Publishers

TP 000 024

✓ *Business Mathematics*
Covers a full range of skill levels, from a review of arithmetic fundamentals to specific topics such as banking, discounting, investments, spreadsheeting, and amortization. Applications focus on typical business situations students will encounter on the job.

✓ *Math for Food Service, 3rd ed.*
Units cover a review of basic math fundamentals; math essentials in food preparation (weights and measures, portion control, converting and yielding recipes, production and baking formulas, metric system); math essentials in food service record keeping (e.g., purchasing and receiving, guest checks, tipping); and essentials of managerial math (e.g., daily cash reports, bank deposits, recipe and food costing, pricing the menu, inventory procedures).

✓ *Practical Food & Beverage Cost Control*
This text uses a practical, hands-on approach to applying cost control methods within food-service establishments to minimize expenditures and improve profits. Issues addressed include "make or buy" decisions, inventory control, profitability analysis, analysis of cost-volume-profit relationships, and forecasting.

✓ *Technical Mathematics*
Using a highly visual approach, this text provides **over 5,000 problems and exercises** covering a wide variety of professional fields to reinforce important mathematical concepts and provide opportunities for students to develop on-the-job problem-solving skills.

✓ *Technical Mathematics with Calculus*
This text contains the same material as Technical Mathematics, with additional chapters that cover calculus—from an introduction through differential equations and numerical methods. Provides **over 8,500 problems and exercises** covering a wide variety of professional fields.

✓ *Vocational-Technical Mathematics, 3rd ed.* TP 000 034

Practical examples from various occupations, including banking, are shown in this text to illustrate the actual on-the-job uses of basic math, algebra, geometry, and trigonometry. Step-by-step instructions are provided for solving problems on the job. Emphasis is placed on the ability of the student to think and work with equal ease with both English and metric systems.

Glencoe/McGraw-Hill

✓ *Essentials of Math with Business Applications*

Designed to provide a review of the fundamental mathematics operations through practice with whole numbers, fractions, decimals, and percentages, this text-workbook provides students with experience in working out business problems involving interest, discount, payroll, depreciation, retail selling, and checking accounts.

✓ *Mathematics with Business Applications*

Texts, student workbooks, and a variety of classroom resources make up this **package** designed to build and strengthen students' basic skills in personal and business math. Thirty optional workshops lead students through a review, practice, and problem-solving cycle for basic math skills. *Problems* provide extensive hands-on skill practice, while *Applications* provide math problems in real-life settings. *Calculator Exercises* are integrated with traditional exercises in each lesson, and *Spreadsheet Applications* at the end of each unit provide real-world computer experience.

✓ *Merchandising Mathematics, 2nd ed.* TP 000 115

After a review of math fundamentals, this text focuses on the merchandising math cycle—a flow of topics that begins with purchasing and continues through pricing, sales, profit calculation, inventory valuation, and planning of future operations. The **exercises and drills** provided are set **in a workplace context.**

Houghton Mifflin Company

TP 000 379

✓ *Integrated Mathematics*

The goal of this text is to develop students' abilities to explore and solve mathematical problems, think critically, work cooperatively with others, and communicate ideas clearly. The units included in this (the first of three texts) are exploring and communicating mathematics; using measures and equations; representing data; coordinates and functions; equations for problem solving; ratios, probability, and similarity; direct variation; linear equations as models; reasoning and measurement; and quadratic equations as models.

TP 000 380

✓ *Integrated Mathematics. Teacher's Edition*

The teacher's edition discusses the integrated math program, presents teaching strategies, and provides information on how to use the teacher's edition. The student text with answers and teaching notes is included.

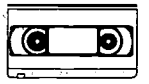
TP 000 426

✓ *Mathematical Connections: A Bridge to Algebra and Geometry*

Topics covered in this text include arithmetic to algebra; integers; equations; graphs and data analysis; geometry; number theory and fraction concepts; rational numbers; ratio, proportion, and percent; circles and polygons; statistics and circle graphs; probability; inequalities and graphing on the coordinate plane; surface area and volume; and polynomials.

Lakeshore Learning Materials

Lakeshore Basics & Beyond materials are designed for students who are hard to reach, at risk of dropping out, or in need of a fresh approach to learning. If you have students in need of remediation or if you are looking for simple, reproducible hands-on activities and cooperative projects for mathematics, Lakeshore may be a good source for you. Some examples of **videos**, **worktexts**, **texts**, and **activity books** that could be of interest follow.



- ✓ *Algebra and Geometry Videos*
- ✓ *Hands-on Math! Activities*
- ✓ *Hands-on Measurement Program*
- ✓ *Math for Careers Worktext*
- ✓ *Math for the Real World Worktext Program*
- ✓ *Math Measurement for the World of Work*
- ✓ *Math Stories for Problem Solving Success*
- ✓ *Real-World Math Through Science Activity Series*
- ✓ *Real World Math Worktext Series: Math for Employment*
- ✓ *Vocational Math Series*
- ✓ *Working Makes Sense Activity Book*

Mathematical Association of America (MAA)

- ✓ *Learning by Discovery: A Lab Manual for Calculus* TP 000 122
  These **28 laboratory modules** can be used as lab components or assigned as independent projects.
- ✓ *The Laboratory Approach to Teaching Calculus* TP 000 123
  In this text, 26 academic institutions that have used the laboratory approach to teaching calculus evaluate their experiences and tell what has worked for them and what has not. A range of experiences is presented.

National Council of Teachers of Mathematics (NCTM)

TP 000 644

✓ *How to Use Conjecturing and Microcomputers to Teach Geometry*

This guide for teachers tells how to use microcomputer software (e.g., Geometric Supposers) to teach students to behave like working mathematicians who conjecture and prove within a community of learners. The approach is described, questions typically asked by teachers are answered, and an introductory lesson is included.

Paradigm Publishing, Inc.

TP 000 685-685

✓ *Math for Workplace Success*

Integrates skill development and mechanics and teaches students to apply basic math skills to solve problems they will encounter in the workplace. (Text and Instructor's Guide)

Prentice Hall

✓ *Applied Calculus for Business, Economics, Life Sciences, and Social Studies, 6th ed.*

In this mathematically correct and reader-friendly introduction to applied calculus, the emphasis is on computational skills, ideas, and problem solving. Numbered, annotated, worked examples clearly show the steps to use in solving given problems. **Over 3,700** carefully selected and **graded problems** are provided, with each set divided into three levels of difficulty. A **variety of real-world applications** related to business and economics are included throughout the text.

✓ *Applied Math for Food Service*

This worktext presents the mathematical skills necessary for food service professionals using a common-sense, step-by-step approach and real-life situations, such as yield tests, calculation of recipe costs, and use of food cost percentages.

✓ *Business Math, 5th ed.*

Using real-world examples from banking, hotel/motel industry, retail, and real estate, this book covers all areas of business mathematics, from the basics (whole numbers, decimals, fractions, percents, statistics, and equations) to business-specific applications relating to payroll, discounts, markup/markdown, interest, credit, and more.

✓ *Technical Mathematics, 3rd ed.*

TP 000 428

Topics covered in this text include numerical computation; introduction to algebra; simple equations and word problems; functions and graphs; geometry; right triangles and vectors; factors and factoring; fractions and fractional equations; systems of linear equations; determinants; matrices; exponents and radicals; quadratic equations; oblique triangles; radian measure, arch length, and rotation; graphs of the trigonometric functions; trigonometric identities and equations; ratio, proportion, and variation; exponential and logarithmic functions; complex numbers; and precalculus material. Discussion of many technical applications is included to show that mathematics has real-world uses.

South-Western Educational Publishing

✓ *Algeblocks*

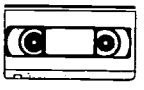
These **reproducible lab activities** and hands-on, student-friendly **manipulatives** help students experience and visualize algebraic concepts at a concrete level. Also available in an interactive **software version.**

✓ *Algebra 1: An Integrated Approach*

This text uses a thematic approach to teaching algebra, with real-life applications, interdisciplinary connections, and connections within mathematics. The chapters cover data and graphs; variables, expressions, and real numbers; linear equations; functions and graphs; linear inequalities; linear functions and graphs; systems of linear equations; systems of linear inequalities; absolute value and the real number system; quadratic functions and equations; polynomials and exponents; polynomials and factoring; geometry and radical expressions; and rational expressions.

Each chapter is organized around a theme. The theme for the chapter on functions and graphs, for example, is sports. The math concepts are all presented in relation to sports-related problems. Teamwork is encouraged; students are asked to solve problems working in small groups and pairs. After a concept is explained, activities give students the opportunity to apply the concept (practice), extend their understanding, and think critically.

Each chapter ends with a project. For the sports theme, the project is to collect, organize, and analyze school sports data and create a Sports Showcase. An Internet address is provided to help students research each project online. Related careers (and the math involved in them) are highlighted throughout each chapter. The sports careers described are greenskeeper, sports referee, and sports statistician.



The **total package** includes not only the text, but also transparencies, theme posters, topic posters, themes video and videodisc, algeblocks, annotated teacher's edition, software-generated assessment, and a teaching resources box with resource books, math handbooks, technology activities for graphing calculator and computer software, study skills activities, and lesson plans.

✓ *Algebra 2: An Integrated Approach*

Similar in format to *Algebra 1* described above, this text covers modeling and predicting; real numbers, equations, and inequalities; functions and graphs; systems of linear equations; polynomials and factoring; quadratic functions and equations; inequalities and linear programming; exponents and radicals; exponential and logarithmic functions; polynomial functions; rational expressions and equations; conic sections; sequences and series; probability; trigonometric functions; and trigonometric equations and identities.

✓ *Applied Business Mathematics, 14th ed.*

Fundamental mathematics are presented in this text within the context of **business and consumer applications**. Activities in each chapter help students develop a personal collection of career-oriented projects and require them to apply critical thinking, problem solving, workplace competencies, and cooperative learning. *Explore Technology* lessons feature work students complete on spreadsheet and database templates, as well as opportunities for students to design their own materials.

✓ *Applied Math: Course Materials*

Samples TP 000 140-143

These course materials stress applications in real-world job situations and allow for a broad range of student entry-level capabilities. The six activity sessions for each unit serve as a guide to the sequence of activities. An implementation notebook is also available. The teacher's guide for each unit contains a page-by-page annotation of the text for students, a teaching outline, correlation of unit goals and subunit objectives, supplementary resource lists, information about video segments, detailed lab prep instructions, and related information sources.

✓ *CORD Applied Mathematics: A Contextual Approach to Integrated Mathematics*

These course materials for a two-year program teach algebra and geometry within the context of occupational settings and engage students—working in cooperative teams—in **lab-centered, hands-on activities** that make mathematical concepts practical and relevant.

✓ *CORD Bridges to Algebra and Geometry: Mathematics in Context*

This integrated learning **package** teaches the foundations of algebra and geometry using an interactive, workplace-centered approach. Working in cooperative teams, students experience mathematical concepts through completion of **hands-on math labs** and class activities. The program offers not only connections and applications to everyday life, but emphasizes the use of math in the workplace through multi-step exercises covering five occupational and personal areas, one of which is business and industry.

TP 000 925-926

✓ *Math Matters: An Integrated Approach*
Similar in format to *Algebra 1* and *Algebra 2*, this three-book program reinforces the connections between algebra and geometry, while developing problem-solving skills. Working with themes that apply to their everyday lives, students explore new math concepts and generalizations by weaving together number sense, algebra, geometry, statistics, and logic.

✓ *Mathematics of Money with Algebra*
Written in a story format for maximum reader involvement, this text presents interesting characters facing a series of financial dilemmas requiring that financial decisions be made. Use of Algebra 1 skills and use of the graphing calculator and computer spreadsheets are integrated throughout. Special projects—such as buying a home or forming a small business—are provided at the end of each chapter.

✓ *Spreadsheet Activities to Math Skills*
The activities in this text involve students in using spreadsheet software as a tool for solving real-life business and consumer mathematical problems dealing with payroll, inventory, installment purchasing, and other day-to-day situations. Activities included become progressively more difficult, with fewer instructions, in order to provide students with the opportunity to improve their critical thinking skills. Includes a template disk containing data files to save keying time.

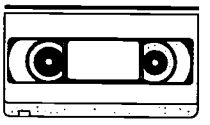
✓ *Vocational Mathematics, 4E*
Firmly rooted in the basics, this business mathematics text-workbook covers decimals, fractions, equivalents, and measurements and applies the concepts to vocational problems.

Sunburst Communications

✓ *Data Visualization: Meaningful Math* — TP 000 640

Using dozens of examples based on real-world situations, this text helps students learn how to describe data with graphs and statistics, discover the best way to describe a set of data, read what the data is saying, and communicate the information through a picture.

✓ *Math Vantage Videos—Patterns Unit* — TP 000 656-661



Math becomes a living subject through these five motivational videos developed by the Nebraska Mathematics and Science Initiative. Designed to enable students to use patterns to explain, create, and predict situations, each topic covered emphasizes problem-solving techniques. Separate videos cover discovering patterns; patterns with ten; sequences and ratios; tessallations; and networks, paths, and knots. Although developed for students in Grades 6-9, these videos could easily be used as supplementary resources for students needing remediation. A teacher's resource book supports the videos.

✓ *Visualizing Algebra: Algebra Problems and Projects for the Function Analyzer* — TP 000 642

Designed to be used with *Visualizing Algebra: The Function Analyzer*, this text provides activities for exploring such topics as points and functions in the coordinate plane; investigating functions in symbolic, graphical, and numerical forms; studying polynomial functions and composition of functions; factoring polynomials; and solving equations.

USA TODAY

✓ *How to Teach Math with USA TODAY*

Designed in partnership with the National Council of Teachers of Mathematics, this teaching guide has students solve real-world math problems using mathematical reasoning. The supplementary student *Stat Book* uses baseball as its theme and challenges kids to use computer statistics to draft their own fantasy league teams. Although the materials are designed for middle school level, they contain ideas that could be adapted and used in applied classes at the senior high school level.

Applied Science

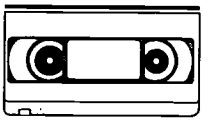
Center for Occupational Research and Development (CORD)

✓ *BioBlox*
These modules present **microscale labs** (with perishables and reusables) to help students explore the many real-world applications of the biotechnology industry, including medical testing and diagnosis, environmental testing, pharmaceutical production, and agricultural developments. Modules can be used with *Applications in Biology/Chemistry* (ABC) units (see South-Western Educational Publishing).

Coastal Video Communications Corp.

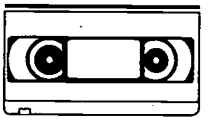
✓ *Office Ergonomics*
✓ *Ergonomics: Your Body at Work*
These 15- to 20-minute videos show how ergonomics (human engineering) can minimize job stress and prevent Cumulative Trauma Disorder.

TP 000 750-751



✓ *General Office Safety: Working Smart*
This 20-minute video (supported by a handbook) shows how to avoid slips, trips, and falls in the workplace.

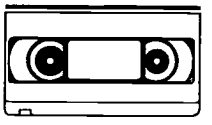
TP 000 752-753



GPN Educational Media

✓ *Introducing Biology: Digestion*
This 30-minute video on digestion includes **hands-on investigations**, collaborative activities, three levels of exercises to provide increasingly challenging practice and problem solving, and real-world problems.

TP 000 892



Instructional Materials Laboratory–Missouri

✓ *Food Science and Technology*
Topics include principles of food preservation, processing foods safely, biochemistry of foods, biotechnology in the food industry, and food selection and consumer health.

TP 000 106

Kendall/Hunt Publishing Company

✓ *ChemCom—Chemistry and Community: A Solution with Substance*
Produced by the American Chemical Society, this text uses intriguing activities to make students aware of chemistry-related issues in their community and their potential contributions to those issues. Students learn and use chemical facts and concepts as needed to understand the societal issues being addressed, and their interest in chemistry grows as they discover its real-world applications. A videodisc package is also available.

Lakeshore Learning Materials

Lakeshore Basics & Beyond materials are designed for students who are hard to reach, at risk of dropping out, or in need of a fresh approach to learning. If you have students in need of remediation or if you are looking for simple, reproducible hands-on activities and cooperative projects for science, Lakeshore may be a good source for you. Some examples of **labs**, **manipulatives**, **activity books**, and **references** that could be of interest follow.

✓ *100 Ready-to-Use Chemistry Activities*
✓ *100 Ready-to-Use Physical Science Activities*
✓ *300 Ready-to-Use Science Activities*
✓ *Cooperative Learning Science Experiences*
✓ *Everyday Science: Real-Life Activities*
✓ *Hands-on Science! 112 High-Interest Activities*
✓ *Simple Machines Hands-on Lab*
✓ *Simple Machines Manipulative Kit*
✓ *Motorized Machines Hands-on Lab*
✓ *Motorized Machines Manipulative Kit*
✓ *Science at Your Fingertips Photo Encyclopedia*
Includes seven books covering force and motion, electricity, light, energy, human body, life, and chemistry.

Prentice Hall

✓ The Globe Fearon division of Prentice Hall publishes biology texts geared to the interest level of Grades 6-12, but with reading levels at Grades 2-4.

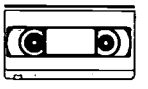
✓ *Chemistry and Our Changing World*
Using an applications-oriented approach, this text focuses on problem solving and the relationship of chemistry to the everyday world.

South-Western Educational Publishing

✓ *CORD Applications in Biology/Chemistry: A Contextual Approach to Laboratory Science*
The ABC materials consist of 12 units: natural resources, water, air and other gases, continuity of life, nutrition, disease and wellness, plant growth and reproduction, animal life, microorganisms, synthetic materials, waste and waste management, and community of life.

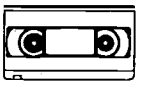
TP 000 829-852, 882

✓ *CORD Biology: Science in Context*
Through contextual instruction, this general biology course puts biology topics in perspective by relating them to work, careers in science, or personal experiences. Each chapter includes information about careers that require the skills being learned and **hands-on activities** and **laboratory investigations** that require application of those skills. Content is divided into five units: continuity and diversity of life, microorganisms, animals, plants, and communities and environment. Coordinated text, lab, and video materials address the diversity of learning styles in today's classroom.



✓ *CORD Principles of Technology*
The PT materials allow students to discover and experience traditional physics concepts in the context of their relationship to four energy systems: mechanical, fluid, electrical, and thermal. Students apply problem-solving and mathematical skills and physics concepts to workplace situations. The materials include student and teacher text materials, workplace-related video programs, mathematical skill labs, and **over 90 hands-on laboratory activities**.

Samples TP 000 151-153



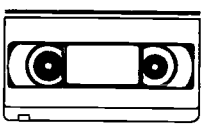
✓ *Making the Connection: Spreadsheet/Database Activities to Build Science Skills*

Designed to reinforce students' science skills using their existing experience with database and spreadsheet software. Activities included become progressively more difficult, with fewer instructions, in order to provide students with the opportunity to improve their critical thinking skills. Includes a template disk containing data files to save keying time.

Sunburst Communications

TP 000 646-655

✓ *The World of Chemistry Videos*



These video and print materials—designed by high school teachers with the help of their students—provide demonstrations, experiments, and suggestions for research projects within an integrated curriculum. Each videotape is 30 minutes long, contains two programs, and is accompanied by a teacher's guide. Videos cover color/measurement; states of matter/the mole; the atom/the periodic table; chemical bonds/organic chemistry; molecular fingerprints/water; the atmosphere/the driving forces; chemical kinetics/catalysts; acids and bases/chemistry of the earth; oxidation and reduction/metals; and polymers/biochemistry.

Contact Information

Agency for Instructional Technology (AIT)
Phone: 812-339-2203
Fax: 812-333-4218
E-mail: <info@ait.net>
Website: <http://www.ait.net>

American Management Association (AMACOM)
Phone: 800-262-9699
Fax: 518-891-3653
Website: <http://www.amanet.org>

Association for Career and Technical Education (ACTE)
(Formerly the American Vocational Association)
Phone: 800-826-9972
Fax: 703-683-7424
E-mail: <acte@acteonline.org>
Website: <http://www.acteonline.org>

Barron's Educational Series, Inc.
Phone: 800-645-3476
Fax: 516-434-3723
Website: <http://www.barronseduc.com>

Butterworth-Heinemann
Phone: 800-366-2665
Fax: 800-446-6520
Website: <http://www.bh.com>

Cambridge Educational
Phone: 800-468-4227
Fax: 304-744-9351
Website: <http://www.cambridgeol.com>

Career Communications, Inc.
Phone: 800-669-7795
Fax: 913-362-4864
E-mail: <ccinfo@carcom.com>
Website: <http://www.carcom.com>

CareerTrack Publications
Phone: 800-334-1018
Fax: 800-622-6211
Website: <http://www.careertrack.com>

Center for Occupational Research and Development (CORD)
Phone: 800-972-2766
Fax: 254-772-8972
E-mail: <stw@cord.org>
Website: <http://www.cord.org>

Coastal Video Communications Corp.
Phone: 800-285-9107

Communication Briefings
Phone: 800-888-2086
Fax: 609-232-8245

Contemporary Books
Phone: 800-621-1918
Fax: 312-540-4687
Website: <http://www.tribune.com/financials/1994_annual/businesses/contemporarybooks.html>

Cuisenaire♦Dale Seymour Publications
Phone: 800-872-1100
E-mail: <info@cuisenaire.com>
Website: <http://www.cuisenaire-dsp.com>

Curriculum and Instructional Materials Center
Oklahoma Department of Vocational and Technical Education
Phone: 800-654-4502
Fax: 405-743-5154
Website: <http://www.okvotech.org/cimc>

Curriculum Publications Clearinghouse
Western Illinois University
Phone: 800-322-3905
Fax: 309-298-2869
E-mail: <CPC@wiu.edu>
Website: <http://www.wiu.edu/users/micpc/index.html>

Delmar Publishers
Phone: 800-865-5840
E-mail: <info@delmar.com>
Website: <http://www.delmar.com>

EDINFO Press
ERIC Clearinghouse for Reading and Communication Skills
Phone: 800-925-7853
Website: <http://www.indiana.edu/~eric_rec>

Glencoe/McGraw-Hill
Phone: 800-334-7344
Fax: 614-860-1877
Website: <http://www.glencoe.com>

Goodheart-Wilcox
Phone: 800-323-0440
Fax: 708-687-5068

GPN Educational Media
Phone: 800-228-4630
Fax: 402-472-1785

Great Source
Houghton Mifflin
Phone: 800-289-4490
Website: <http://www.greatsource.com>

Houghton Mifflin Company
Phone: 800-733-2828
Fax: 800-733-2098
Website: <http://www.hmco.com>

Instructional Materials Laboratory
University of Missouri–Columbia
Phone: 800-669-2465
E-mail: <iml@tiger.coe.missouri.edu>
Website: <http://www.iml.coe.missouri.edu>

Kendall/Hunt Publishing Company
Phone: 800-228-0810
Website: <http://www.kendallhunt.com>

Lakeshore Learning Materials
Phone: 800-421-5354
Fax: 310-537-5403
Website: <http://www.lakeshorelearning.com>

Mathematical Association of America (MAA)
Phone: 800-331-1622
Fax: 301-206-9789
Website: <http://www.maa.org>

National Council of Teachers of Mathematics (NCTM)
Phone: 703-620-9840
Fax: 703-476-2970
E-mail: <infocentral@nctm.org>
Website: <http://www.nctm.org>

NCRVE (National Center for Research in Vocational Education)
University of California–Berkeley
Phone: 800-762-4093
Fax: 510-642-2124
E-mail: <AskNCRVE@ncrve.berkeley.edu>
Website: <http://ncrve.berkeley.edu>

Ohio Agricultural Education Curriculum Materials Service
Phone: 614-292-4848
Fax: 800-292-4919
E-mail: <wwaideli@magnus.acs.ohio-state.edu>
Website: <http://www-cms.ag.ohio-state.edu>

Paradigm Publishing, Inc.
Phone: 800-535-6865
Fax: 612-771-5629

Prentice Hall
Phone: 800-288-4745
Website: <http://www.prenhall.com>

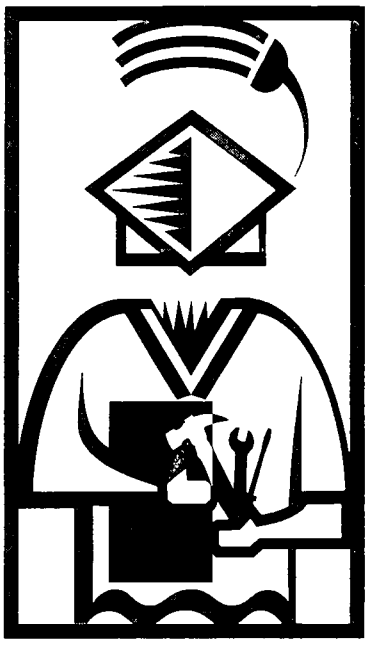
Procter & Gamble Educational Services
P. O. Box 599, Cincinnati, OH 45201-0599
E-mail: <RHMA61A@prodigy.com>

South-Western Educational Publishing
Phone: 800-354-9706
Fax: 800-487-8488
Website: <http://www.swep.com>
Math Discussion List:
Send message to <majordomo@list.thomson.com>
Type only <subscribe south-western-math; *your_email_address*>

Sunburst Communications
Phone: 800-321-7511
E-mail: <service@nysunburst.com>
Website: <http://www.nysunburst.com>

USA TODAY
Phone: 800-757-TEACH
Website: <http://www.usatoday.com/educate/home.htm>

Virginia Vocational Curriculum and Resource Center
Phone: 804-261-5075
Fax: 804-261-5079
E-mail: <vvcrc@vvcrc.tec.va.us>
Website: <http://vvcrc.tec.va.us>



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Sample OCAP

The following pages are ***excerpts*** from the 1996 Occupational Competency Analysis Profile (OCAP) for *Business Administration and Management*. They are included to show that academic skills are an inherent part of any occupational profile—which is why the OCAP (or ITAC) document is a good source of information for academic teachers seeking to identify occupational contexts for their instruction. Pages from three sections of the OCAP are provided.

In the excerpt from the first section (OCAP pages 4-11), the units, competencies, and competency builders for the occupational area include many academic skills. For example, Builder 2.6.8, *Prepare budgets*, clearly involves the use of mathematics skills. Competency 2.1, *Maintain a safe working environment*, could provide a context for studying health issues in a biology class. Competency 2.4, *Manage employee performance*, requires strong communication skills.

The ***level*** of applied academic skills that—according to business and industry—students must master to qualify for and be successful in their occupation of choice is shown in the excerpt from the second section (OCAP pages 33-34). This Job Profiling process was developed by American College Testing (ACT) as part of its Work Keys assessments, which cover the following academic skills: locating information, reading for information, applied mathematics, applied technology, listening, writing, and teamwork.

The excerpts from the third section (OCAP pages 59-60 and 65-68) identify which academic competencies from the state standards (those in effect in 1996) were selected by business and industry representatives as most crucial for entry-level employees in the occupational area.

BUSINESS ADMINISTRATION AND MANAGEMENT

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Division of Vocational and Adult Education
Ohio Department of Education

Vocational Instructional Materials Laboratory
Center on Education and Training for Employment

Introduction

What is an OCAP?

According to the *Action Plan for Accelerating the Modernization of Vocational Education: Ohio's Future at Work*—

> A comprehensive and verified employer competency list will be developed and kept current for each program
>
> —Imperative 3, Objective 2—

The Occupational Competency Analysis Profiles (OCAPs) are the Ohio Division of Vocational and Adult Education's response to that objective.

OCAPs are competency lists—verified by expert workers—that evolve from a modified DACUM job analysis process involving business, industry, labor, and community agency representatives from throughout Ohio. The OCAP process is directed by the Vocational Instructional Materials Laboratory located at The Ohio State University's Center on Education and Training for Employment.

How is the OCAP used?

Each OCAP identifies the occupational, academic, and employability skills (or competencies) needed to enter a given occupation or occupational area. The OCAP not only lists the *competencies* but also clusters those competencies into broader *units* and details the knowledge, skills, and attitudes (*competency builders*) needed to perform each competency.

Within the competency list are two levels of items: core and advancing. *Core items*, which are essential for entry-level employment, are required to be taught and are the basis for questions on the Ohio Vocational Competency Assessment (OVCA). *Advancing items* (marked with an asterisk) are those needed to advance in a given occupation.

School districts may add as many units, competencies, and/or competency builders as desired to reflect local employment needs, trends, and specialties. Local advisory committees should be actively involved in the identification and verification of additional items. Vocational and applied academic instructors will be able to formulate their courses of study using the varied contents of the OCAP and will be able to monitor competency gains via the new criterion-referenced competency testing program, which is tied to the competencies identified on the OCAP.

Unit 1: Economic and Business Concepts

Competency 1.1: Demonstrate knowledge of the nature of business

Competency Builders:

1.1.1 Identify types of business organizations and functions
1.1.2 Explain the components of a business plan
1.1.3 Identify business reporting and information flow
1.1.4 Identify the ways in which organizational functions are interdependent
1.1.5 Identify types of communication channels (e.g., formal, informal)
1.1.6 Define the role of strategic planning in a business
1.1.7 Identify generally accepted business ethics
1.1.8 Differentiate between ethics and legality

Competency 1.2: Demonstrate knowledge of economic concepts

Competency Builders:

1.2.1 Explain basic economic concepts
1.2.2 Interpret economic terminology
1.2.3 Describe the characteristics of a free enterprise system
1.2.4 Compare/contrast various forms of competition (e.g., pure competition, oligopoly, monopoly)
1.2.5 Identify the cyclical nature of the economy (e.g., unemployment, recession, inflation, balance of trade, budget deficits)
1.2.6 Identify the effects of public and private economic activity on the business sector
1.2.7 Identify how world economic geography concepts, boundaries, barriers, cultures, and politics impact on the balance of trade and import/export processes
1.2.8 Compare/contrast foreign economic and political systems
1.2.9 Compare/contrast international and U.S. banking practices
1.2.10 Apply economic concepts to the global market

Competency 1.3: Demonstrate knowledge of legal concepts

Competency Builders:

1.3.1 Explain basic business law concepts
1.3.2 Interpret legal terminology
1.3.3 Identify the terms of company contracts, policies, and procedures
1.3.4 Identify basic kinds of commercial paper
1.3.5 Interpret contracts and/or legal documents*
1.3.6 Classify contracts that fall within the statute of frauds*
1.3.7 Identify elements of an enforceable contract
1.3.8 Identify requirements of negotiability
1.3.9 Identify workers' rights regarding workplace issues (e.g., safety, drug testing, harassment, discrimination, privacy)
1.3.10 Describe how various laws impact working conditions, wages and hours, civil rights, social security, disability, unemployment insurance, and pensions
1.3.11 Describe government regulations relevant to conducting business
1.3.12 Describe how various laws impact competition (e.g., Sherman Act, Robinson-Patman, NAFTA)
1.3.13 Identify international law and the role of governments as they pertain to business*
1.3.14 Compare/contrast international and U.S. legal practices*
1.3.15 Apply legal concepts to the global market*

*Advancing

Competency 1.4: Demonstrate knowledge of marketing concepts

Competency Builders:

1.4.1 Explain basic marketing concepts (internal and external)
1.4.2 Interpret marketing terminology (e.g., marketing mix)
1.4.3 Identify ways businesses compete with one another (e.g., quality, service, status, price)
1.4.4 Identify target markets
1.4.5 Analyze internal and external markets
1.4.6 Determine appropriate customer service levels
1.4.7 Identify strategies for relating to customers
1.4.8 Identify strategies for monitoring internal and external customer needs
1.4.9 Identify alternative marketing strategies (e.g., micro, macro, smart services)
1.4.10 Select marketing concepts appropriate to identified markets

Competency 1.5: Demonstrate knowledge of management concepts

Competency Builders:

1.5.1 Define *management*
1.5.2 Identify management styles
1.5.3 Explain the major functions of management (e.g., planning, organizing, leading, controlling, and evaluating)
1.5.4 Identify the activities that are part of each management function
1.5.5 Compare/contrast management functions
1.5.6 Identify ways in which authority, accountability, and responsibility relate to task accomplishment
1.5.7 Identify problem-solving steps and techniques
1.5.8 Identify decision-making skills and techniques
1.5.9 Identify critical thinking skills and techniques
1.5.10 Describe past, current, and emerging management trends (e.g., quality circles, suggestion systems, total quality management, risk management, total preventive maintenance, continuous improvement, time management, team building, inventory management, flexible time, telecommuting)
1.5.11 Compare/contrast foreign cultures and customs
1.5.12 Explain the influences of foreign management styles

Unit 2: Management and Supervision

Competency 2.1: Maintain a safe working environment

Competency Builders:

2.1.1 Access needed safety information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts)
2.1.2 Identify health and safety standards established by government agencies
2.1.3 Explain relationships between health, safety, and productivity
2.1.4 Comply with government and/or company rules and regulations related to health and safety
2.1.5 Identify preventive measures for dealing with the main causes of accidents in the facility
2.1.6 Identify preventive measures for dealing with the main causes of health problems (e.g., carpal tunnel syndrome) in the facility

Competency 2.1: Maintain a safe working environment—Continued

2.1.7 Identify preventive measures for dealing with violations of personnel security
2.1.8 Ensure maintenance of a clean work area
2.1.9 Perform safety audits and inspections
2.1.10 Solve safety problems using problem-solving, decision-making, and critical thinking skills

Competency 2.2: Guide assigned areas of responsibility/accountability using goals consistent with established organizational goals and strategies

Competency Builders:

2.2.1 Set short- and long-term goals for assigned areas of responsibility/accountability
2.2.2 Demonstrate commitment to established goals and vision
2.2.3 Obtain support for goals
2.2.4 Provide support for goals
2.2.5 Monitor goal achievement
2.2.6 Adjust goals
2.2.7 Communicate goal achievement
2.2.8 Provide recognition for goal achievement

Competency 2.3: Perform staffing functions

Competency Builders:

2.3.1 Develop plans and procedures for identifying staffing needs
2.3.2 Implement staffing needs plan
2.3.3 Develop job descriptions
2.3.4 Develop hiring and promotion policies and procedures in compliance with state and federal employment laws*
2.3.5 Prepare guidelines for selecting most qualified person for specific position
2.3.6 Comply with state and federal employment laws and company hiring policies and procedures
2.3.7 Identify resources for locating candidates
2.3.8 Recruit employees
2.3.9 Identify most appropriate candidates for position (e.g., appropriate skills, team fit, contractual specifications)
2.3.10 Interview candidates for position
2.3.11 Follow up on information provided on job applications (e.g., contact references listed)
2.3.12 Recommend or select applicants for employment
2.3.13 Orient new employees
2.3.14 Maintain personnel records
2.3.15 Comply with labor contracts
2.3.16 Comply with Workers' Compensation guidelines
2.3.17 Provide for unconventional work schedules (e.g., flex time, shared positions)
2.3.18 Identify additional or alternative employee benefits that the company might consider furnishing to employees and their families

Competency 2.4: Manage employee performance

Competency Builders:

2.4.1 Apply management/leadership style appropriate for situation
2.4.2 Communicate performance expectations
2.4.3 Create/maintain an environment supportive of productivity
2.4.4 Monitor employee performance
2.4.5 Maintain performance records
2.4.6 Evaluate employee performance
2.4.7 Provide constructive criticism and feedback
2.4.8 Counsel employees (e.g., concerning personal issues, career objectives, drug and alcohol abuse, violence)
2.4.9 Discipline employees
2.4.10 Make recommendations based on employee performance (e.g., transfer, promote, dismiss)
2.4.11 Manage the change process (e.g., for right sizing, technologies, globalization, retraining)
2.4.12 Adhere to company policies and federal laws concerning nondiscrimination and harassment
2.4.13 Demonstrate sensitivity to diversity, including gender, culture, race, language, physical and mental challenges, and family structures
2.4.14 Demonstrate appreciation of diversity, including gender, culture, race, language, physical and mental challenges, and family structures
2.4.15 Apply knowledge of motivational theories in selecting management techniques (e.g., Maslow, Herzberg)
2.4.16 Solve personnel problems using problem-solving, decision-making, and critical thinking skills

Competency 2.5: Provide employee development activities*

Competency Builders:

2.5.1 Analyze employee development needs (e.g., retraining, updating, stress management)*
2.5.2 Select development strategies designed to meet individual and group needs*
2.5.3 Identify the benefits of employee development activities offered outside the organization (e.g., workshops, conferences, course work, professional associations)*
2.5.4 Secure personnel, resources, materials, and equipment for employee development activities*
2.5.5 Monitor employee development activities*
2.5.6 Keep employees informed about development opportunities*
2.5.7 Encourage employee participation in development activities*
2.5.8 Evaluate employee progress*
2.5.9 Provide feedback to employees concerning their progress*
2.5.10 Provide formal and informal recognition for employee development*

Competency 2.6: Perform strategic planning functions*

Competency Builders:

2.6.1 Guide the planning process using problem-solving, decision-making, and critical thinking skills*
2.6.2 Analyze needs*
2.6.3 Secure needed information through research*
2.6.4 Develop goals and objectives*
2.6.5 Prioritize goals and objectives*

Continued

Competency 2.6: Perform strategic planning functions—Continued*

2.6.6 Develop action plan for achieving objectives*
2.6.7 Project trends and outcomes using forecasting techniques*
2.6.8 Prepare budgets*
2.6.9 Analyze budgets*
2.6.10 Develop strategic plan*

Competency 2.7: Perform routine management functions

Competency Builders:

2.7.1 Guide the management process using problem-solving, decision-making, and critical thinking skills
2.7.2 Develop management objectives
2.7.3 Conduct task analyses
2.7.4 Create/maintain organizational and/or departmental charts
2.7.5 Maintain procedure manuals
2.7.6 Solve space utilization problems using math and problem-solving skills
2.7.7 Follow chain of command
2.7.8 Maintain confidentiality
2.7.9 Clarify company policies and procedures
2.7.10 Communicate cost containment factors
2.7.11 Prepare budgets
2.7.12 Monitor budget activity
2.7.13 Prepare managerial reports
2.7.14 Analyze daily production reports
2.7.15 Represent the organization to the public

Competency 2.8: Perform project management functions*

Competency Builders:

2.8.1 Guide the project management process using problem-solving, decision-making, and critical thinking skills*
2.8.2 Identify tools used in project planning (e.g., PERT, GANTT)*
2.8.3 Analyze needs*
2.8.4 Establish priorities*
2.8.5 Determine quality measures and countermeasures*
2.8.6 Prepare project budgets*
2.8.7 Develop project plans*
2.8.8 Meet project time lines*
2.8.9 Schedule employee work assignments*
2.8.10 Develop management reporting system*
2.8.11 Monitor project progress*
2.8.12 Collect project data and records*
2.8.13 Analyze project data and records*
2.8.14 Interpret project data and records*
2.8.15 Take action on the basis of project data and records*

Competency 2.9: Manage work flow and operations

Competency Builders:

2.9.1 Plan physical layout and work flow
2.9.2 Illustrate business or job procedures/operations using flowcharts
2.9.3 Prioritize work
2.9.4 Establish/maintain operating policies and procedures
2.9.5 Establish/maintain production standards
2.9.6 Establish/maintain linkages with other departments*
2.9.7 Systematize work
2.9.8 Communicate operating policies and procedures, priorities, linkages, and standards*
2.9.9 Provide work assignments and instructions
2.9.10 Monitor progress
2.9.11 Solve work flow/operations problems using problem-solving, decision-making, and critical thinking skills
2.9.12 Prepare productivity reports*
2.9.13 Communicate contents of productivity reports to others in accordance with company procedures*

Competency 2.10: Maintain company security (facilities, equipment, products, information)

Competency Builders:

2.10.1 Access needed information using company references (e.g., procedural manuals, documentation, standards, work flowcharts)
2.10.2 Plan security procedures in accordance with business ethics*
2.10.3 Communicate security procedures internally
2.10.4 Comply with security procedures (i.e., established rules, regulations, and codes)
2.10.5 Document security procedures
2.10.6 Perform security checks
2.10.7 Correct security problems using problem-solving, decision-making, and critical thinking skills

Competency 2.11: Support the company's social and community involvement

Competency Builders:

2.11.1 Propose environmental, education, and community needs and social issues on which to focus company support
2.11.2 Select issues on which to focus company support*
2.11.3 Participate in social and/or community activities
2.11.4 Encourage staff involvement
2.11.5 Recognize the importance of the company's social and community relationships and their effects on the company

Unit 3: Accounting and Financial Functions

Competency 3.1: Apply mathematical skills

Competency Builders:

3.1.1 Solve addition, subtraction, multiplication, and division problems manually
3.1.2 Solve addition, subtraction, multiplication, and division problems using a calculator
3.1.3 Convert/reduce fractions
3.1.4 Compute percentages and ratios
3.1.5 Solve business-related problems using algebraic formulas
3.1.6 Determine whether sufficient, insufficient, or extraneous information is given for solving a problem
3.1.7 Solve finance charge and annual percentage rate problems using a calculator
3.1.8 Solve compound interest problems
3.1.9 Construct tables or graphs using computer software
3.1.10 Interpret tables and graphs (line, circle, and bar)
3.1.11 Apply business statistics
3.1.12 Compute business and financial data
3.1.13 Perform data analysis and probability*

Competency 3.2: Perform general accounting functions

Competency Builders:

3.2.1 Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts)
3.2.2 Apply generally accepted accounting principles and procedures in various business environments
3.2.3 Apply basic managerial accounting concepts
3.2.4 Select computer software appropriate for the function to be performed
3.2.5 Select mathematical skills appropriate for the function to be performed
3.2.6 Process receivables
3.2.7 Process payables
3.2.8 Process purchases
3.2.9 Monitor expense accounts
3.2.10 Prepare budgets
3.2.11 Make financial decisions using problem-solving, decision-making, and critical thinking skills

Competency 3.3: Perform payroll functions

Competency Builders:

3.3.1 Access needed information using manufacturers' manuals, documentation, terminology, and other reference materials
3.3.2 Comply with company policies and procedures related to payroll
3.3.3 Apply generally accepted accounting principles and procedures
3.3.4 Select mathematical skills appropriate for the function to be performed
3.3.5 Select computer software appropriate for the function to be performed
3.3.6 Process payroll documents
3.3.7 Calculate employee earnings and deductions
3.3.8 Prepare payroll checks
3.3.9 Complete payroll records
3.3.10 Monitor personnel costs
3.3.11 Prepare payroll tax reports

Competency 3.4: Perform financial analyses*

Competency Builders:

3.4.1 Interpret data on financial statements (e.g., income statement, balance sheet, cash flow statement, net worth statement)*
3.4.2 Analyze financial reports*
3.4.3 Prepare comparative (actual vs. budgeted) income statements*
3.4.4 Prepare cost and revenue analyses*
3.4.5 Prepare financial statement analyses*
3.4.6 Interpret sales forecasts*
3.4.7 Explain how dynamic foreign exchange rates affect profit*
3.4.8 Compare/contrast traditional and nontraditional sources of financing*

Unit 4: Information Technology

Competency 4.1: Demonstrate knowledge of computerized information processing

Competency Builders:

4.1.1 Identify applications of computers in business
4.1.2 Explain data processing concepts
4.1.3 Interpret information processing terminology
4.1.4 Interpret software licensing agreements
4.1.5 Identify computer hardware components and software
4.1.6 Identify current operating systems
4.1.7 Locate needed information on computer printouts
4.1.8 Interpret information on computer printouts
4.1.9 Locate errors on computer printouts
4.1.10 Identify the procedures for installing equipment and software

Job Profiling—How It Works

VIML's Job Profiling process was initiated by mailing surveys to current workers in OCAP occupations all across Ohio. The survey's purpose: to have actual workers in specific occupations rate job tasks according to each task's frequency and criticality—that is, the amount of time spent performing each task relative to other tasks and the importance of each task to overall job performance.

To complete the survey, participants examined OCAP competencies for their occupation. Based on the survey's results, VIML staff produced a list of the most critical competencies in each occupation.

The next stage of Job Profiling was to convene committees of subject-matter experts to perform "leveling," which involved the following tasks:

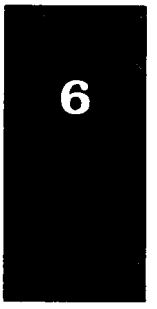
- Examining the frequency and criticality competency lists for an occupation
- Reviewing the levels associated with each of the seven Work Keys academic skills: *Locating Information, Reading for Information, Applied Mathematics, Applied Technology, Listening, Writing,* and *Teamwork*
- Identifying the level of skill students must master relative to each Work Keys academic skill in order to successfully perform the occupational competencies

Finally, in 1995, the initial leveling of Work Keys academic skills for the occupational area covered by this OCAP was revalidated by the new employer panel convened to update the OCAP (see inside back cover).

Example of Job Profiling

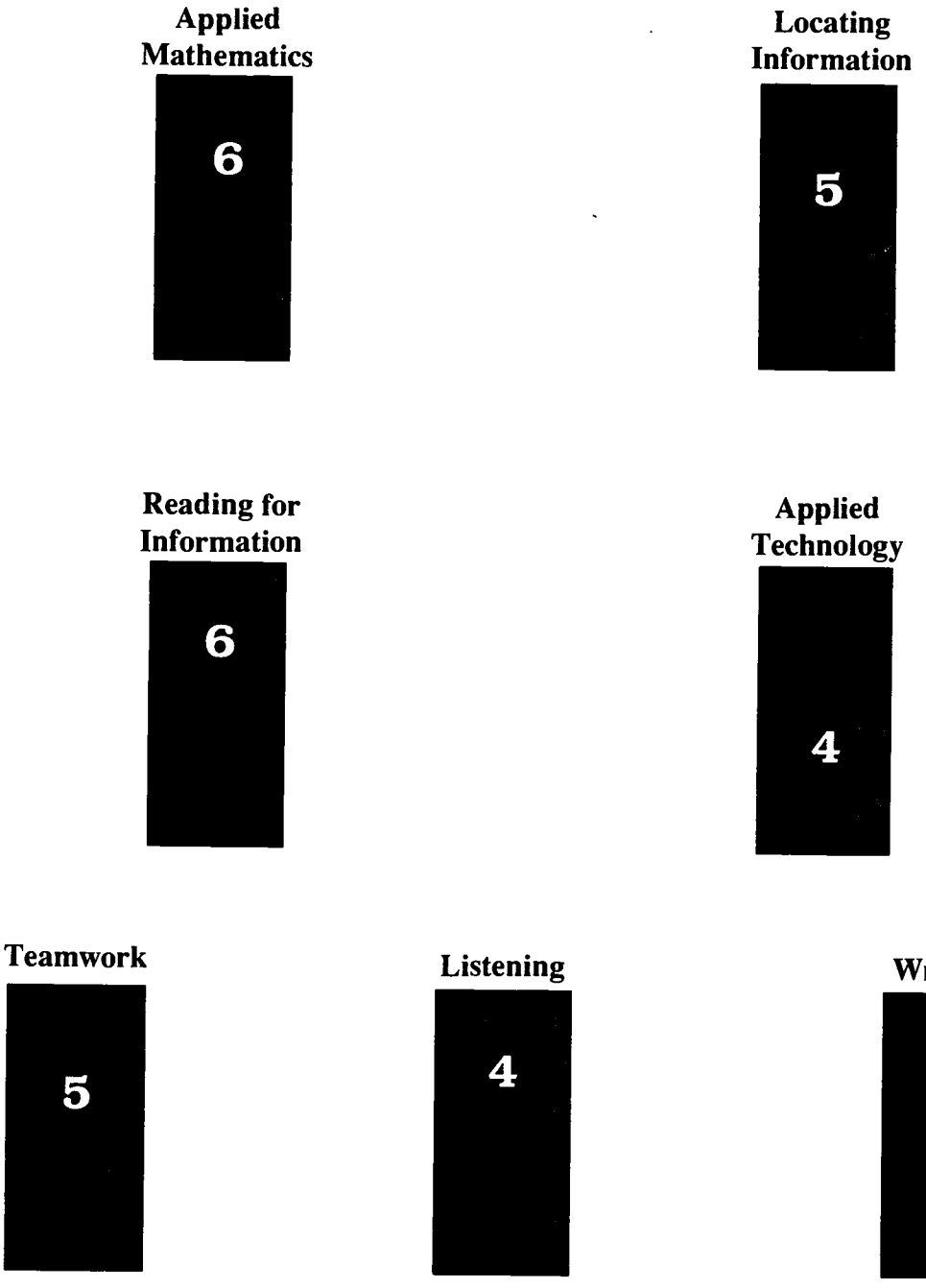
For every occupational area, there are shaded graphs to represent each of the seven Work Keys academic skills. Each graph shows the range of levels for that particular skill; the shading represents the academic skill level required by an entry-level worker in that occupation, as determined by the Job Profiling committee. For example:

Applied Mathematics



In the example shown, Applied Mathematics has a skill range of 3–7. The required skill level, determined by Job Profiling and shown by the highlighting, is 6.

Academic Job Profile: Business Administration and Management



NOTE: Definitions of each level in each of the seven academic skill areas are provided on the pages that follow.

Academic Competencies: Business Administration and Management

The Business Administration and Management OCAP panel of expert workers (see member list on the inside back cover) identified the following academic competencies (from the total list, pp. 44-58) as most crucial to the entry-level success of an employee in the area of business administration and management. It is recommended that these competencies be taught in an applied manner for students enrolled in business administration and management programs.

Unit: Communications Skills

Subunit: Reading—Structure

Competencies:

RS1	Exhibit knowledge of language structure
RS2	Recognize that there may be more than one interpretation of reading selections
RS5	Develop and use an increasingly sophisticated vocabulary gained through context
RS6	Apply knowledge of language structure to reading
RS7	Explain why there may be more than one interpretation of reading selections
RS8	Recognize effect of literary devices on meaning
RS10	Recognize relationship of structure to meaning
RS11	Describe various interpretations and levels of meaning in reading selections (e.g., symbolism, nuance)
RS15	Apply an expanding vocabulary gained through reading
RS16	Explain various interpretations and levels of meaning in reading selections (e.g., symbolism, nuance)
RS17	Analyze use of literary devices (e.g., extended metaphor, simile, personification, hyperbole, pun, alliteration)
RS18	Understand use of literary techniques (e.g., irony, satire, allegory, onomatopoeia)

Subunit: Reading—Meaning Construction

Competencies:

RM1	Demonstrate ability to recognize appropriate pre-reading strategies
RM2	Describe effectiveness of a reading selection
RM3	Read to clarify personal thinking and knowledge
RM4	Support interpretation of text by locating and citing specific information
RM7	Engage in self-selected reading activities
RM8	Confirm and extend meaning in reading by researching new concepts and facts
RM9	Self-monitor and apply corrective strategies when communication has been interrupted or lost
RM11	Assess effectiveness of a selection read
RM12	Use reading as a possible problem-solving strategy to clarify personal thinking and knowledge
RM16	Assess validity and quality of selection read (e.g., predict, summarize, analyze, infer)

Continued

Subunit: Reading—Meaning Construction—Continued

RM17	Clarify meaning when reading, using knowledge of literary devices, stylistic diction, and other semantic elements
RM18	Compare personal reaction to critical assessment of a literary selection
RM19	Assess validity of diverse literary interpretations
RM20	Use reference books to find, evaluate, and synthesize information

Subunit: Reading—Application

Competencies:

RA1	Select and read material for personal enjoyment and information
RA2	Read a variety of complete, unabridged works (e.g., self-selected or assigned stories, essays, nonfiction, plays, novels, poetry)
RA5	Develop and apply knowledge of the interrelationship of concepts (e.g., construction of webs, graphs, timelines)
RA6	Read selections from a variety of styles and formats, recognizing that style and format influence meaning
RA7	Extend value of reading, writing, speaking, viewing, and listening by pursuing, through reading, new concepts and interests developed as a result of these activities

Subunit: Reading—Multidisciplinary

Competencies:

RM1	Connect themes and ideas across disciplines through literature
RM2	Read to facilitate learning across curriculum
RM3	Read to develop awareness of human rights and freedom
RM4	Participate actively in a community of learners
RM5	Recognize and explain interaction between literature and various cultural domains (e.g., social, technological, political, economic)
RM6	Explore and analyze a variety of cultural elements, attitudes, beliefs, and value structures by reading and experiencing our diverse literary tradition, including works by men and women of many racial, ethnic, and cultural groups
RM7	Value thinking and language of others
RM9	Read to facilitate content learning

Subunit: Oral Communication—Application

Competencies:

OA1	Become proficient at using interviewing techniques
OA2	Give an oral interpretation for a specific audience
OA3	Develop and apply oral communication skills for cooperative/collaborative learning
OA4	Use oral communication for a variety of purposes and audiences (e.g., negotiations, book reviews, rationales)
OA5	Develop and apply decision-making strategies
OA6	Practice interviewing techniques
OA7	Apply interviewing techniques to purposeful interviews
OA8	Focus oral interpretation on a specific audience

Subunit: Oral Communications—Multidisciplinary

Competencies:

OM1	Value thinking and language of others
OM2	Develop oral projects collaboratively
OM3	Be involved in individual, small-group, and whole-group language activities
OM4	Participate actively in a community of learners
OM5	Investigate language and cultural differences through oral language activities

Unit: Mathematics Skills

Subunit: Numbers and Number Relations

Competencies:

NR1	Compare, order, and determine equivalence of real numbers
NR2	Estimate answers, compute, and solve problems involving real numbers
NR3	Compare and contrast real number system, rational number system, and whole number system
NR4	Extend knowledge to complex number system, and develop facility with its operation

Subunit: Measurement

Competencies:

M1	Estimate and use measurements
M2	Understand the need for measurement and the probability that any measurement is accurate to some designated specification
M3	Understand and apply measurements related to power and work
M4	Understand and apply measurement concepts of distance-rate-time problems and acceleration problems with real-world experiments
M5	Use real experiments to investigate elasticity, heat, sound, electricity, magnetism, light, acceleration, velocity, energy, and gravity
M6	Use real-world problem situations involving mass and weight
M7	Use real-world problem situations involving simple harmonic motion

Continued

Subunit: Measurement—Continued

M8	Establish ratios with and without common units
M9	Construct and interpret maps, tables, charts, and graphs as they relate to real-world mathematics
M10	Understand and solve rate-change problems
M11	Understand and solve right triangle relationships as they relate to measurement—specifically those that deal with the Pythagorean theorem
M12	Graph and interpret ordered pairs
M13	Compute total sales from a variety of items
M14	Comprehend and compute rates of growth or decay
M15	Comprehend, compute, and interpret real problems involving annuities
M16	Develop an ability to identify real problems and provide possible solutions
M17	Express and apply different types of measurement scales
M18	Determine area and volume

Subunit: Estimation and Mental Computation

Competencies:

E1	Use estimation to eliminate choices in multiple-choice tests
E2	Use estimation to determine reasonableness of problem situations in a wide variety of applications
E4	Use mental computation when computer and calculator are inappropriate

Subunit: Data Analysis and Probability

Competencies:

D1	Organize data into tables, charts, and graphs
D2	Understand and apply measures of central tendency, variability, and correlation
D3	Use curve fitting to predict from data
D4	Use experimental or theoretical probability, as appropriate, to represent and solve problems involving uncertainty
D5	Use computer simulations and random number generators to estimate probabilities
D6	Test hypotheses using appropriate statistics
D7	Read, interpret, and use tables, charts, and graphs to identify patterns, note trends, draw conclusions, and make predictions
D8	Identify probabilities of events involving unbiased objects
D9	Use sampling and recognize its role in statistical claims
D10	Design a statistical experiment to study problem, conduct experiment, and interpret and communicate outcomes
D11	Describe normal curve in general terms, and use its properties
D12	Create and interpret discrete probability distributions
D13	Understand concept of random variable
D14	Apply concept of random variable to generate and interpret probability distributions, including binomial, uniform, normal, and chi square

Subunit: Algebra

Competencies:

A1	Describe problem situations by using and relating numerical, symbolic, and graphical representations
A2	Use language and notation of functions in symbolic and graphing settings
A16	Describe measures of central tendency, mean, median, mode, and variance algebraically and graphically
A28	Analyze and describe errors (and their sources) that can be made when using computers and calculators to solve problems
A29	Decide whether problem situation is best solved using computer, calculator, paper and pencil, or mental arithmetic/estimation techniques
A36	Translate verbal statements into symbolic language
A37	Simplify algebraic expressions

Subunit: Geometry

Competencies:

G1	Create and interpret drawings of three-dimensional objects
G2	Represent problem situations with geometric models and apply properties of figures
G3	Apply Pythagorean theorem
G4	Demonstrate knowledge of angles and parallel and perpendicular lines
G5	Explore inductive and deductive reasoning through applications to various subject areas
G9	Use deductive reasoning

Subunit: Patterns, Relations, and Functions

Competencies:

P3	Translate among tables, algebraic expressions, and graphs of functions
P12	Use graphing calculator or computer to graph functions
P20	Explore graphs in three dimensions

Unit: Science Skills

Subunit: Scientific Inquiry

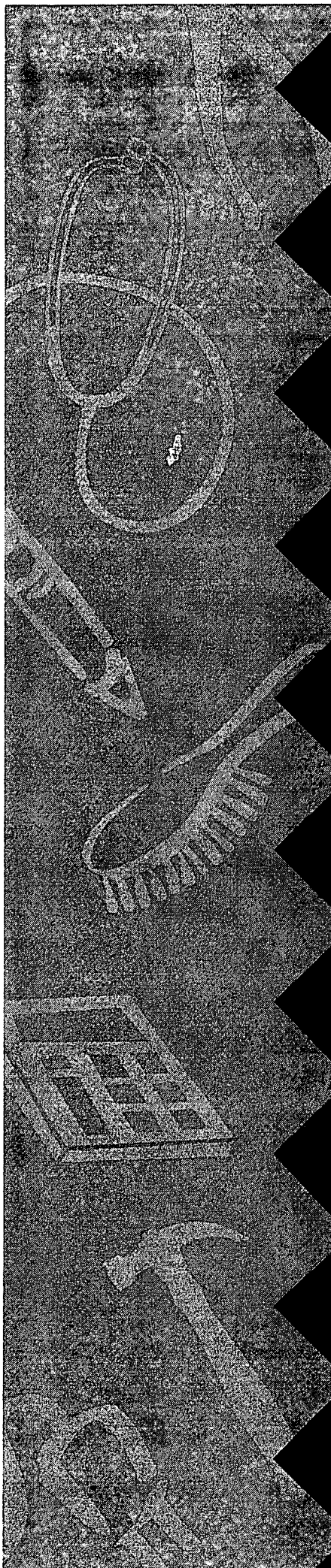
Competencies:

Q1	Check the appropriateness and accuracy of measures and computations using various strategies (e.g., estimations, unit analysis, determination of significant figures)
Q2	Use ratios, proportions, and probabilities in appropriate problem situations
Q3	Translate information from and represent information in various forms with equal ease (e.g., tables, charts, graphs, diagrams, geometric figures)
Q4	Use existing algebraic formulas and create new ones in appropriate problem-solving situations
Q5	Estimate and justify probabilities of outcomes of familiar situations based on experimentation and other strategies

Continued

Subunit: Scientific Inquiry—Continued

Q6	Invent apparatus and mechanical tools needed to perform unique tasks in various situations
Q7	Identify, compare, and contrast different modes of inquiry, habits of mind, and attitudes and dispositions
Q8	Design investigations that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks, and benefits; and show evidence of concern for the health and safety of humans and nonhuman species)
Q9	Make and read scale drawings, maps, models, and other representations to aid planning and understanding
Q10	Seek elaboration and justification of data and ideas, and reflect on alternative interpretations of the information
Q11	Use appropriate units for counts and measures
Q12	Create and use databases (electronic and other) to collect, organize, and verify data and observations
Q13	Design and conduct investigations with multiple variables
Q14	Communicate the results of investigations clearly in a variety of situations
Q16	Trace the development (e.g., history, controversy, and ramifications) of various theories, focusing on supporting evidence and modification with new evidence
Q17	Select, invent, and use tools, including analog and digital instruments, to make and record direct measurements
Q18	Observe and document events and characteristics of complex systems
Q20	Create multiple representations of the same data using a variety of symbols, descriptive languages, mathematical concepts, and graphic techniques
Q21	Generate testable hypotheses for observations of complex systems and interactions
Q22	Document potentially hazardous conditions and associated risks in selected homes and public areas
Q23	Participate in public debates, relying on documented and verified data to construct and represent a position on scientific issues
Q25	Read, verify, debate, and, where necessary, refute research published in popular or technical journals of science (e.g., Discover, Omni, Popular Mechanics)
Q27	Conduct theory-based research using surveys, observational instruments, and other methods
Q28	Modify personal opinions, interpretations, explanations, and conclusions based on new information
Q29	Analyze error and develop explanations in various domains
Q31	Demonstrate various logical connections between related concepts (e.g., entropy, conservation of energy)
Q32	Account for discrepancies between theories and observations
Q33	Analyze the changes within a system when inputs, outputs, and interactions are altered
Q34	Create, standardize, and document procedures
Q38	Suggest and defend alternative experimental designs and data explanations (e.g., sampling, controls, safeguards)
Q39	Recognize and communicate differences between questions that can be investigated in a scientific way and those that rely on other ways of knowing
Q40	Draw conclusions based on the relationships among data analysis, experimental design, and possible models and theories
Q42	Investigate, assess, and comment on strengths and weakness of the descriptive and predictive powers of science



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