ED 398 417   CE 072 281

AUTHOR   Joyner, Randy L., Ed.
TITLE   Research for Education in a Democratic Society.
                Proceedings of the 1996 AERA Vocational Education
                Special Interest Group (New York, NY, April 8-12,
                1996).
INSTITUTION   American Educational Research Association,
                Washington, DC. Vocational Education Special Interest
                Group.
PUB DATE   Apr 96
NOTE   134p.
PUB TYPE   Collected Works - Conference Proceedings (021) --
                Reports - Research/Technical (143)

EDRS PRICE   MF01/PC06 Plus Postage.
DESCRIPTORS   Basic Skills; Competence; Educational Needs;
                *Education Work Relationship; Employment Potential;
                *High Risk Students; Inservice Teacher Education;
                *Job Skills; *Mathematical Applications; Outcomes of
                Education; Postsecondary Education; *School Business
                Relationship; Secondary Education; Teacher Attitudes;
                Tech Prep; *Vocational Education; Vocational
                Education Teachers

ABSTRACT
        This proceedings contains an invited
paper--"Employers Expectations of Graduates: Implications for
Schools" (Henry A. Peel) and nine refereed papers from a conference
on vocational education research. The refereed papers are the
following: "Producing Knowledge in Career-Oriented Programs:
Students' Perspectives on School Experiences" (Victor A.
Hernandez-Gantes, Dorothy Sanchez); "Generic Skills at Work:
Implications for Occupationally-Oriented Education" (Cathleen Stasz);
"The Impact of a Community Based School-to-Work Program for High Risk
Youth" (Laurel Adler et al.); "Education for Employment: An
Analytical Framework Relating Schooling to Workforce Preparedness"
(Noemi Friedlander); "Conducting Successful School-to-Work Transition
Programs: Teacher Expertise and Professional Development Needs"
(Curtis R. Finch et al.); "A Case Study Analysis of Two
School-to-Work Transition Partnerships" (Michael J. Berson, Nick
Elksnin); "A Comparison of Students' Achievement in Applied
Mathematics for TECH PREP and Algebra I" (C. Kenneth Tanner, Patricia
J. R. Chism); "Student Performance after Instruction in Applied
Mathematics" (Malcolm Keif, Bob R. Stewart); and "The Importance of
Workplace Basics Competencies (SCANS) as Perceived by Secondary
Vocational Education Teachers" (Lonnie Echternacht, Ling-Yu Melody
Wen). (KC)

RESEARCH FOR EDUCATION IN A DEMOCRATIC SOCIETY

1996 AERA VOCATIONAL EDUCATION SPECIAL INTEREST GROUP

April 8-12, 1996
New York City

A
E
R
A
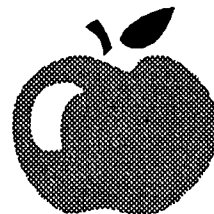
VOCATIONAL EDUCATION

SPECIAL INTEREST GROUP

PROCEEDINGS

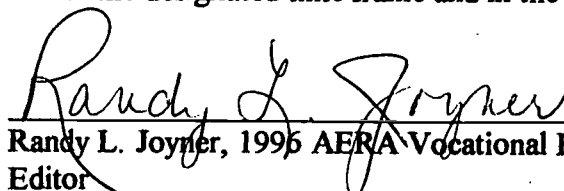American Educational Research Association

1996 Annual Meeting
New York, NY

April 8-11, 1996

Randy L. Joyner
1996 SIG Program Chair and Proceedings Editor
East Carolina University

NOTES FROM SIG PROGRAM CHAIR

The 1996 American Education Research Association (AERA) Annual Meeting was held in New York, New York, April 8-12, 1996. The theme for the AERA Conference was grounded in growing acceptance of the need for interdependence among the human service professions (e.g., education, social work, school psychology, public health administration) in order to effective serve children, adults, and families in America. The 1996 AERA Annual Meeting focused on pioneering research and scholarly efforts associated with interdisciplinary partnerships and the resulting interprofessional collaboration.

The AERA Vocational Education Special Interest Group (SIG) had three sessions: two paper presentation sessions and a business meeting. A copy of the SIG program agenda is provided on pages iii-v. The ten papers presented at the conference were selected through a blind, peer refereed process. There were a total of 18 reviewers; with each proposal being reviewed by three reviewers. The nine papers contained herein are from authors who wished to have their papers published in the Proceedings and also submitted them within the designated time frame and in the appropriate format.

Randy L. Joyner, 1996 AERA Vocational Education SIG Program Chair and Proceedings Editor

For further information, contact:

Randy L. Joyner, Ed.D.
Associate Professor
Business, Vocational, and Technical Education
School of Education
East Carolina University
2317 General Classroom Building
Greenville, NC 27858-4353

919-328-6175

E-Mail: bejoyner@ecuvm.cis.ecu.edu

TABLE OF CONTENTS

1996 AERA ANNUAL CONFERENCE

VOCATIONAL EDUCATION SIG

NEW YORK, NEW YORK

APRIL, 1996

Thursday, April 11, 1996

Hilton
Room 537
6:15 p.m. - 7:45 p.m.

45.07 Business Session

President: Michael K. Swan, North Dakota State University

Program Chair: Randy L. Joyner, East Carolina University

Secretary: Vivian Arnold, East Carolina University

Invited Speaker: ***Skills Required of Employees With Only a High School Diploma***
                        Henry Peel, Associate Dean
                        School of Education, East Carolina University

Friday, April 12, 1996

Sheraton
Liberty 4, 3rd Floor
12:25 p.m.-1:55 p.m.

52.44   School-to-Work: Its Past, Its Future, Its Legacy

Chair/Discussant: Hollie Thomas, Florida State University

Program:

Education for Employment: An Analytical Framework Relating Schooling to Workforce Preparedness. Amy Friedlander, Arlington, Virginia.

Conducting Successful School-To-Work Transition Programs: Teacher Expertise and Profession Needs. Curtis R. Finch, B. June Schmidt, and Margaret Moore; Virginia Polytechnic Institute and State University., Blacksburg, Virginia.

The Impact of a Community Based School To Work Program for High Risk Youth. Laurel Adler, Peter Seals, Larry Weigel; East San Gabriel Valley Regional Occupational Program; and Rita Hemsley and James Dick; University of California, Riverside.

A Case Study Analysis of Two School-To-Work Transition Partnerships. Michael Berson & Nick Elksnin, The Citadel, South Carolina.

Friday, April 12, 1996

Sheraton
Carnegie 2, 3rd Floor
2:15 p.m.-4:15 p.m.

54.53   Skills Necessary for Occupationally-Oriented Education

Chair/Discussant: Mary Jean Lush, Delta State University, Mississippi

Program:

> *Generic Skills at Work: Implications for the Occupationally Oriented.*
> Cathleen Stasz, Rand Corporation, Santa Monica, California.

> *A Comparison of Students' Achievement in Applied Mathematics for TECH
> PREP and Algebra I.*   C. Kenneth Tanner; The University of Georgia,
> Athens, Georgia, and Patricia J. R. Chism; Stephens County High School,
> Toccoa, Georgia.

> *Student Performance After Instruction in Applied Mathematics.*   Bob R.
> Stewart and Malcolm Keif; University of Missouri, Columbia, Missouri.

> *High Performance Learning for Adolescents in Retail and Fast Food Service.*
> James R. Stone; University of Minnesota, St. Paul, Minnesota.

> *Producing Knowledge in Career-Oriented Programs: Students Indicators and
> Perspectives on Schooling Experiences.*   Victor M. Hermandez-Gantes
> and Dorothy Sanchez, Center on Education and Work; University of
> Wisconsin, Madison, Wisconsin.

> *The Importance of Workplace Basics Competencies (SCANS) as Perceived by
> Secondary Vocational Education Teachers.*   Lonnie Echternacht;
> University of Missouri, Columbia, Missouri; and Ling-Yu Melody Wen;
> National Chang-Hua University of Education, Chang-Hua, Taiwan,
> Republic of China.

v

Invited Paper Presentation

EMPLOYERS EXPECTATIONS OF GRADUATES: IMPLICATIONS FOR SCHOOLS

Henry A. Peel

Associate Dean
School of Education
East Carolina University
Greenville, North Carolina

1

Employers Expectations of Graduates: Implications for Schools

Henry A. Peel
Associate Dean
School of Education, East Carolina University

Introduction

Recent educational reform initiatives have evolved from business, education, government, and community leaders' commitment to an improved workforce as well as an educated and civic populace. There are any number of commissions, task forces, panels, and study groups that have reported that schools are failing to adequately educate students and have issued their own sets of improvement guidelines. Many of these reports are aimed at what schools should do to prepare students for the workplace. This paper summarizes the results of a study by Volk and Peel (1994) which examined the skills required by employers who hire high school graduates and discusses the implications for schools committed to having students capable of meeting these employers' expectations.

The Study

A survey of manufacturers in North Carolina was used to determine basic academic and vocational skills required of employees with only a high school diploma. Manufacturers with over 500 employees, identified through the *Directory of North Carolina Manufacturing Firms*, were mailed surveys. Each survey was addressed to the representative identified in the *Directory*; most often the company president or plant manager. Approximately one month after the initial mailing, a follow-up mailing was conducted for those not responding to the first mailing.

From the 289 firms identified and sent surveys, 129 responded. This represented a 45 percent response rate. For data analysis, the manufacturing firms were categorized by the number of employees at their location and their type of manufacturing operation.

Focus of Study

The surveys requested that the employers rate specific skills in 9 categories as not required for the job (rated as a 0.00), desired but not required (rated as a 1.00), or absolutely required (rated as a 2.00). The nine categories were:

> Reading, Writing, and Math Skills
> Communication Skills
> Critical Thinking Skills
> Group Interaction Skills
> Personal Development Skills
> Computer Skills
> Technological System Skills
> Leadership Skills
> Employability Skills

Results

A comparison of the importance of each category was determined by rating each category on overall importance and the following ranking emerged:

Group Interaction Skills	1.83
Employability Skills	1.79
Personal Development Skills	1.63
Critical Thinking Skills	1.51
Leadership Skills	1.42
Technological System Skills	1.34
Reading, Writing and Math Skills	1.33
Communication Skills*	1.31
Computer Skills	.82

*Communication Skills ranked around third, when the need for foreign language and ability to sketch objects in multi-view are not considered.

Group Interaction Skills were the most important skills area high school-graduated employees must have. This category included such skills as working well with colleagues and supervisors, working as a team member, and respecting others' opinions.

The second most important skill area identified by employers was Employability Skills. High school graduates should have skills necessary to maintain quality standards, maintain regular work habits, and take pride in their work.

Personal Development Skills was the third most important skill area. This category included exhibiting self-esteem, establishing personal goals, and desiring further education.

Basic Reading, Writing, and Math Skills were viewed as being less important to employers than most other skill categories. These basic academic skills ranked seventh of the nine categories examined. Interestingly, skill statements relating to statistics, algebra, and geometry were rated below 1.00 for this category.

Computer Skills were indicated as being less important than all others. Although there was a need for basic keyboarding skills, little indication was given for other areas such as spreadsheets, databases and computer-aided drafting.

A general observation made from these comparisons was that skills relating to affective domains; that is, the attitudes, personalities, and emotions of employees were rated generally higher than those categories dealing with technical or academic concerns.

Group Interaction Skills

Group Interaction Skills category received strong support from employers. In fact, of the nine skills categories on the survey, high school graduates needing group interaction skills were marked the highest. With the exception of only three areas--recognizing cultural diversity,

3

recognizing equality of sexes, and participating in group discussions— more than 100 of the 129 respondents indicated all of theses skills were absolutely required of high school graduates.

Respondents especially want graduates who can work well with supervisors, team members, and colleagues. All three of these statements were rated on the average above 1.90; indicating the importance for high school graduates to get along with others in the workplace.

High school graduates who can work as team members was absolutely required by 94 percent of employers. This skill goes beyond having to work well with supervisors and colleagues—workers must be able to work together as a team in order to solve problems in the organizational environment. Tied closely with working well with others and participating as a team member, is respecting others' opinions. This statement received a 1.85 average rating; indicating its importance.

Two other areas while receiving slightly lower ratings, were still viewed as being very important. These skills, seemingly related, are the willingness to ask questions and participate in group discussions. Finally, while there was some disagreement regarding the importance of recognizing cultural and ethnic diversity and the equality of the sexes; both areas received strong endorsements.

Below are the items rated for this category and the mean responses when manufacturing employers were asked if the skills were absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Group Interaction Skills		
High school graduates should have the necessary skills to:	Mean	SD
work well with supervisors	1.95	0.25
work as a member of a team	1.94	0.27
work well with colleagues	1.93	0.28
respect others' opinions	1.85	0.38
be willing to ask questions	1.81	0.41
participate in group discussions	1.74	0.47
recognize equality of the sexes	1.72	0.5
recognize cultural and ethnic diversity	1.64	0.53

Employability Skills

Employability Skills were the second highest rated skill category in this survey. With the exception of participating in community and civic activities, there was general agreement on the desirability of all skills in this area. A further indication of the importance of the particular skills in this category, was that maintaining quality standards and regular work habits were the two skills from throughout the entire survey that were most often rated by respondents as being absolutely required. Of the 129 employers, 125 marked these areas as absolutely required of high school

4

graduates. Employers also want high school graduates who are punctual and take pride in their work. Over 93 percent (120 of the 129 respondents) absolutely required these skills.

Of the four top-rated items, only one respondent per item did not support the skill as being required or desired. For example, of the 129 respondents, 124 absolutely required, four desired, and one did not require that employees demonstrate punctuality.

While less important, it was expected that high school graduates practice a healthy lifestyle and have knowledge of the company. Again, many employers (over 70 percent) absolutely required that graduates demonstrate these skills. The least important area required in this category was for employees to participate in community and civic activities. Still, over 93 percent at least desired this participation.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Employability Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
maintain quality standards	1.96	0.23
maintain regular work habits	1.96	0.23
demonstrate punctuality	1.95	0.25
take pride in one's work	1.92	0.3
practice a healthy lifestyle	1.76	0.45
have knowledge of the company	1.71	0.47
participate in community/civic activities	1.25	0.56

Personal Development Skills

There was again a great deal of consensus among employers on the need for high school graduates to enter the workforce with well-defined personal development skills. High school graduates should exhibit self-esteem to be successful in today's manufacturing world. As was the case for graduates having basic problem solving skills under the Critical Thinking Skills category, every employer required or desired that employees exhibit self esteem.

Respondents want high school graduates who set goals and work towards advancement. Employers also expect high school graduates to recognize career options. Finally, skills related to further education and training were considered important. Over 98 percent of the employers absolutely required or desired all five skills in this category. Emphasizing the importance of this category, the category of Personal Development Skills was rated as the third most-important category, when average group responses were compared.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

13

Personal Development Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
exhibit self-esteem	1.71	0.46
establish personal goals	1.67	0.51
work toward advancement	1.64	0.5
recognize career options	1.57	0.51
desire further education or training	1.57	0.51

Critical Thinking Skills

Critical thinking skills were generally viewed as being absolutely required or desired by respondents. Three of the four statements were rated on the average above 1.58; indicating their importance. Generally, employers desired problem-solvers and independent thinkers. The remaining area of critical thinking, the ability to formulate a hypothesis, received less support.

Every employer surveyed required or desired that high school graduate employees demonstrate the ability to solve problems. This item was one of only two statements on the survey that every employer supported to at least some degree. Of the 129 respondents, 96 required and 33 desired this skill. Every employer surveyed required or desired that high school graduate employees demonstrate the ability to solve problems. This item was the second of only two statements on the survey that every employers supported to at least some degree. Of the 129 respondents, 96 required and 33 desired this skill.

Also important for high school graduates is the ability to troubleshoot problems and make decisions on their own. Over half of the survey respondents absolutely required that employees have these skills. Only one response in each of these areas did not at least desire this skill.. There was little consensus among employers on the need for graduates to form hypotheses in the workplace. One-fourth of the respondents absolutely required, one-half desired, and one-forth did not require this skill.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Critical Thinking Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
understand problem-solving processes	1.74	0.44
troubleshoot problems	1.68	0.48
make decisions independently	1.58	0.51
formulate a hypothesis	1.05	0.73

6

Leadership Skills

Most employers required or desired graduates to have leadership abilities. There was a great deal of consensus among respondents that graduates should enter the workforce with general skills and abilities to lead others. Regardless of whether high school graduates begin in leadership positions, demonstrating leadership skills was viewed as important to employers. Over 96 percent thought this skill was absolutely required or desired. This skill compared favorable with the skills listed under Group Interaction Skills category.

While over half of those surveyed absolutely required graduates to be able to negotiate and resolve conflicts, it was less important for high school graduates to be able to motivate others. Only 36 percent absolutely required this skill. Improving organizational effectiveness was considered a valuable skill for high school-graduated employees to possess. Over 50 percent of respondents absolutely required that degreed employees, participate such productivity-related matter.

Generally, employers are looking for those individuals who have the skills necessary to lead the organization. This skill was desired by 97 percent of respondents.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Leadership Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
negotiate and resolve conflicts	1.53	0.57
improve organizational effectiveness	1.5	0.59
demonstrate leadership qualities	1.39	0.55
motivate others	1.28	0.6

Technological System Skills

Employers responding to this survey were mixed on the importance of high school graduates needing to understand technology systems. While more than 50 percent absolutely required high school-degreed employees to have the ability to select proper tools or equipment for a given task and follow written directions to assemble equipment, less than 30 percent required graduates to calibrate instrumentation or know how technological systems operate.

The skills necessary to select the proper tools or equipment received an average rating of 1.73; suggesting its importance. Following written directions, closely related to the skills of following procedural instruction in the Communication Skills category received a rather strong endorsement. Knowing how technological systems operate with such features as the inputs, processes, and outputs of manufacturing and communication technology, was absolutely required by only 30 percent of the respondents. However, it was desired by 55 percent. Calibrating

7

instrumentation was the only skill listed on the survey that received a 1.00 rating; indicating the neutrality of employers desiring this skill.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Technological System Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
select proper tools or equipment	1.73	0.51
assemble equipment following written directions	1.48	0.63
know how technological systems operate (e.g. communications, manufacturing)	1.16	0.65
calibrate instrumentation	1	0.73

Reading, Writing and Math Skills

Employers agreed that basic math and reading skills were absolutely required for high school graduates to successfully enter the workforce. Graduates should be able to perform the simple mathematical functions of addition, subtraction, multiplication, and division. Almost equally important was an understanding of common job related words. Generally, high school graduates who are seeking employment need to be proficient in reading at a level comparable to reading the local newspaper. Seventy-six percent of those surveyed absolutely require this level of reading to be successful on the job.

There is less agreement among employers concerning required mastery level of skills beyond basic reading and math. For instance, few employers require high school-degree employees to understand algebra. While half of the respondents desire this skill, less than 20 percent require it. Understanding principles of geometry was, in fact, as important to employers as algebra. An interesting finding from this study was that more employers desired skills in elementary statistics than either algebra or geometry.

Writing skills were viewed as being less important than the reading and math, with employers generally desiring these skills, but not requiring them.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Reading, Writing and Math Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
perform simple mathematical functions (+,-,*./)	1.9	0.35
understand common job-related words	1.89	0.34
read the local newspaper	1.73	0.51
read instruments such as gauges and meters	1.62	0.55
write simple memoranda	1.48	0.56
read technical manuals	1.36	0.57
estimate time, weight, and speed measurements	1.26	0.66
understand elementary statistics	1.16	0.58
read blueprints	0.95	0.75
perform algebraic equations	0.88	0.67
understand geometric principles	0.86	0.65
write a technical report	0.85	0.64

Communication Skills

A great deal of consensus was found among employers related to communication skills needed for high school graduates. There were few employers who did not require graduates to be able to give or follow clear directions. All but two survey respondents required or desired these general listening and speaking skills. The expectation is that high school graduates who go directly to work, must be able to follow procedural instructions and speak clearly. Listening skills and the skills necessary to give clear directions were viewed as being equally important. Over seventy percent of the respondents considered these skills to be absolutely required of high school graduates.

While communication skills encompass more than just listening and speaking, there was little indication that employers required such skills as representing information graphically. Less than seven percent absolutely required their employees have the ability to sketch objects in multi-view.

While most employers did not require high school graduates to speak or understand another language, one-fourth of the employers required or desired these skills.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

9

Communication Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
follow procedural instructions	1.91	0.31
speak in clear sentences	1.81	0.41
listen to formal presentations	1.71	0.49
give clear directions	1.71	0.49
sketch and dimension an object in multi-view	0.45	0.62
understand and/or speak another language	0.3	0.54

Computer Skills

Computer skills were the least important category of skills required of high school graduates. This skill category ranked the lowest of all nine categories. The only skill receiving a high endorsement was the ability to operate a computer keyboard. Even in this case, only 46 percent of respondents absolutely required this skill of its high school-graduated employees. Understanding software for word processing was rarely required but often desired. Only 13 percent of respondents absolutely required, while 68 percent desired this skill. Nineteen percent did not require this skill at all.

All other skills listed in this category were rarely absolutely required. With the exception of keyboarding operations and word processing, no computer skill listed was absolutely required by more than 15 of the 129 respondents (12 percent). Equally as important, over 30 percent did not require any of these five skills for high school graduates to enter their manufacturing firms. For instance, even the skill and ability to understand DOS commands was not required by 33 percent of employers. Computer-aided drafting skills were not required by 54 percent.

Below are the items rated for this category and the mean response when asked if absolutely required (2.00), desired but not required (1.00), or not required for the job (0.00).

Computer Skills		
Skill Statement	Mean	SD
High school graduates should have the necessary skills to:		
operate a computer keyboard	1.42	0.58
operate a word processing software	0.95	0.56
understand DOS commands	0.79	0.63
operate spreadsheet software	0.78	0.59
operate database software	0.72	0.57
operate desktop publishing software	0.6	0.59
operate computer-aided drafting software	0.5	0.59

10

Implications

Documents such as *America's Choice, High Skills or Low Wages!*, *The SCANS Report,* and *America and the New Economy* have identified educational standards and workplace skills. These documents described in great detail the state of the American economy and the changes being made in the workforce.

North Carolina's workforce is a reflection of the type and amount of education its citizens receive. With nearly 20 percent of high school graduates not continuing further education through community colleges, universities, or military service; the skills they receive from their terminal program is of paramount importance. This point, coupled with the over 12 percent high school dropout rate, places even greater significance on the high school experience. Employers on the other hand, are left with a pool of individuals who may, or may not have the necessary skills for the types of positions available.

This study was designed to clarify the necessary skills employers desired of high school graduates. The focus group for the study was manufacturing firms in North Carolina employing more than 500 individuals at their particular locations. Results indicate that high school-graduated employees will remain a commodity in the future. That is, most firms will remain constant or increase the number of jobs requiring a high school diploma.

Further results indicate that these graduates may need different skills from what is currently being suggested. What has been traditionally perceived as the skills necessary for high school graduates to be successful in the workplace was not reflected by the results. Reading, writing and math skills, while important, were not given the priority that would be expected. Conversely, group interaction skills received an overwhelming endorsement. Generally, the affective domain was emphasized by employers.

Educators, policy makers, and the public are, therefore, recommended to consider these findings when setting educational priorities, procedures and improvement strategies for the future. The Executive Summary of this study was eventually disseminated to State Representatives, school superintendents, and manufacturers. In total, over 6,000 copies of the report, detailing the results through tables and charts, have been made available by the authors and the Eastern North Carolina Consortium for Assistance and Research in Education at East Carolina University. The Executive Summary has been used by school systems in curriculum alignment and curriculum revision processes. It has been used as part of the East Carolina University School of Education's planning process and was shared at the 1996 American Association of Colleges of Teacher Education to begin a study group to consider workforce preparedness.

Public schools and colleges that prepare public school teachers have an important challenge to consider preparing students for the workforce. Making teachers aware of demands of the workforce and having them adjust to prepare students for the twenty-first century are vital. This report may be used as a point of discussion.

References

Carnevale, A. (1991). America and the new economy. Alexandria, VA: The American Society for Training and Development.

11

National Center for Education and the Economy (1991). America's choice: High skills or low wages. Washington: author.

North Carolina Department of Economic and Community Development (1992). Directory of North Carolina manufacturing firms. Raleigh: author.

North Carolina State Board of Education (1985). Statistical profile of North Carolina public schools. Raleigh: author.

Northern Illinois University, Center for Governmental Studies (1991). Building public-private partnerships to improve vocational education in Illinois. Dekalb: author.

Secretary's Commission on Achieving Necessary Skills (1991). What work requires of schools: A SCANS report for America. Washington: US Department of Labor.

Volk, K. & Peel, H. (1994). Basic academic and vocational skills required of employees with only a high school diploma. (Executive Summary). Greenville: The Eastern North Carolina Consortium for Assistance and Research in Education, East Carolina University School of Education.

REFEREED PAPERS

Producing Knowledge In Career-Oriented Programs: Students' Perspectives On Schooling Experiences

Victor M. Hernández-Gantes

and

Dorothy Sanchez
Center on Education and Work
University of Wisconsin-Madison

Abstract

This paper presents findings of a national longitudinal study of 82 high school students enrolled in five occupational/career-oriented programs (e.g., Tech Prep, youth apprenticeship, career academies). Derived from this longitudinal study, the purpose of this paper was to describe students' perspectives on schooling experiences which facilitate authentic learning through a systematic comparative analysis of qualitative information. The findings of this study supported the positive benefits of situated cognition strategies on students learning. The authenticity of a variety of learning experiences connecting school and work in an occupational context seemed to provide an excellent medium that facilitates student engagement in the acquisition and production of new knowledge. Apprenticeship opportunities occurring formally and informally in and out-of-the school, allowed students to learn from experts in their field of interest, advanced students, and other individuals playing different roles in their preparation. Authentic instructional activities emphasized in both school and reinforced through work-based learning activities appeared to be critical to the success of career-oriented programs and to the quality of student learning. Two additional benefits were identified in the form of meaningful connections students were able to make regarding the application of knowledge to real-world situations and development of personal motivation to take responsibility for own learning and career development. There are important implications for practice including the development of challenging integrated academic-vocational curricula, professional development on authentic instruction (e.g., emphasis on higher-order thinking and problem-solving skills), and understanding of strategies to engage all students in substantive conversation in classroom activities.

Introduction

In a now classic episode of "I love Lucy," Lucille Ball played a line worker in a factory trying to keep up with the screening of chocolates on a conveyor belt. An otherwise mindless task was turned into one of the most memorable and funniest episodes of the show. Her comic portrayal of top-down management, inflexible line production, and low workers' skills required in the workplace was outright funny. Just another thing of the past, we might think. But is it? The world of work has changed substantially since the times of Lucille Ball. High performance companies now emphasize teamwork involving managers and workers in problem solving, and demand from workers critical thinking and communication skills to participate effectively in contemporary management styles (Bailey, 1991; Smith, 1995). However, employers think that we are still trapped in the past educating individuals for outmoded management styles

14

and low-skill jobs. A report of the William T. Grant Foundation, Commission on Work, Family and Citizenship (1988) indicated that the majority of students graduating from high school lack the necessary skills for successful participation in the workforce or college. Herein lies a call for action and education reforms. Various authors agree on the severity of this problem and have advocated the improvement of linkages between education and work. In his book, *Education and work for the year 2000*, Wirth (1992, p. 154) observed that "we really have crossed over into an electronic/communications era—a post-industrial era that will not permit us, without heavy penalty, to cling to outdated industrial styles of thinking and practice. Hedrick Smith (1995, p. 127) further observed that "the old American educational model no longer fits the new competitive game. Old style *general education* does not deliver enough thinking employees for tomorrow's economy."

Current reform efforts represent a response to these calls for preparing individuals to become problem solvers, critical thinkers, and users of reasoning and communication skills in a variety of real-world situations (Secretary's Commission on Achieving Necessary Skills, 1991; United States Congress, 1994). Designed and implemented with these goals in mind, several initiatives are under way (e.g., youth apprenticeship, Tech Prep), but making progress on this ambitious charge is a challenge that requires quite a departure from traditional modes of teaching and learning. First, it requires a shift from a heavily controlled classroom in which the instructor is the dispenser of knowledge to a more open teaching environment where both students and teachers participate in making sense and understanding learning activities. Second, it calls for moving from an emphasis on rote memorization of facts and figures to more active ways of learning (e.g., by engaging students in generating knowledge through research and problem solving). Third, it demands a shift from individual and fragmented teaching efforts to a collaborative approach grounded in integrated learning activities linking not only subject matter in the school but also with work-based learning occurring outside the school. Some researchers have studied the impact of programs linking education and work on academic performance outcomes (Heebner, 1995) and broad benefits of program participation (Pauly, Kopp, & Haimson, 1995), while others have focused on integration issues (Stasz, Kaganoff, & Eden, 1994) and teaching methods (Gregson, 1994). There is limited evidence, however, documenting how students participate and evaluate schooling experiences leading to generative learning grounded in different program contexts (i.e., Tech Prep, career academies, youth apprenticeship, magnet programs) and based on their own perspectives.

The purpose of this study was to describe students' perspectives on schooling experiences involving active and authentic learning in five programs linking education and work. Findings emerged from a qualitative analysis of a longitudinal study of high school students guided by two major research questions: (a) How do students participating in programs featuring different occupational contexts engage in authentic learning?, and (b) what schooling experiences facilitate the generation of authentic knowledge? The findings that emerged were consistent with the principles supporting the concepts of situated learning (Brown, Collins, & Duguid, 1989) and authentic instruction (Newmann & Wehlage, 1995).

Situated Learning

Brown and associates (1989) defined situated cognition is defined as learning occurring in meaningful contexts through cognitive apprenticeships. That is, in situations in which students are expected to complete real-world learning activities with the assistance of mentors or expert practitioners in fields relevant to the subject matter. Under these conditions, Harley (1993) added that situated learners are able to acquire and generate information and create their own knowledge. Central to the success of situated cognition is the exposure and participation in

15

apprenticeship activities where students can learn from more experienced learners. Through these interactions students come to understand the application of knowledge in meaningful contexts and acculturate to real-world situations (Brown et al., 1989; Hanks, 1992; Tripp, 1993). The authenticity of the context in which learning takes place and the nature of the interactions between learners and mentors are essential to situated cognition. These authentic learning activities should be characterized by coherent experiences built around actual practices, problems, and practitioners encountered in real-world situations (Brown et al., 1989; Griffin, 1995; Harley, 1993; Suchman, 1987). The effectiveness of situated learning has been documented using a variety of curriculum materials and situated learning experiences on elementary, high school, and adult students (Black, & Schell, 1995; Cognition and Technology Group at Vanderbilt, 1993; Gregson, 1994; Griffin, 1995). Studies to date, however, have been conducted on isolated experiences (e.g., response to mathematics in context, map reading) or using simulation activities involving exposure to problem scenarios, role playing, and videos. There is little information describing how students view their experiences in programs where the whole focus is on situated learning (e.g., youth apprenticeship, career academies).

Innovative programs featuring current education reforms offer great opportunities to study how students acquire and generate knowledge in authentic contexts pervasive to each program. With claims to offer authentic learning opportunities through school-based (i.e., integration of academic and vocational disciplines, emphasis on problem solving, critical thinking), and work-based learning (for example internships, apprenticeships, mentorships), the question that remains is: are these programs helping students engage in meaningful learning?

Authentic Instruction and Learning

Brown and colleagues (1989) believe that authentic activities is what produces meaningful learning by connecting students with realistic applications of knowledge and the culture of the context in which knowledge is applied or generated. This, Hernández-Gantes and Phelps (1995) argued, is what drives the school-to-work transition movement. By exposing students to relevant educational experiences linking both school and work in occupational contexts consistent with their career aspirations, they become better prepared for life after high school. The question is whether some forms of situated cognition are authentic and how can we measure the extent and success of authentic instruction and learning (Tripp, 1993; McLellan, 1994). McLellan (1994) identified six key components of situated cognition useful for evaluation purposes: (a) apprenticeship, (b) collaborative practices, (c) opportunities for reflection, (d) coaching, (e) practical experiences, and (f) integration of learning skills. In an earlier paper McLellan (1993) also provided several strategies for evaluation including the use of models, portfolios, summary statistics, diagnosis, and criteria for reflection and assessment. The framework developed by Newmann and Wehlage (1995) on authentic achievement is perhaps most useful in understanding how students produce new knowledge through disciplined inquiry that integrates the use of knowledge, skills, and technology. Newmann and Wehlage use standards to evaluate the quality, success, or proficiency of students participating in authentic learning activities. Their criteria for authenticity was developed around three areas: construction of knowledge, disciplined inquiry, and value beyond school. They contend that student-centered practices including discussions, small-group work, and applied projects do not necessarily provide authentic experiences unless instruction involves an emphasis on higher-order thinking, deep knowledge, substantive conversation, and connections to real-world situations encountered outside the school. The standards for authentic instruction are described below in Figure 1 (see Newmann & Wehlage, 1995, for a detailed description of standards and supporting framework).

16

Figure 1. Standards for authentic pedagogy: Instruction

Construction of Knowledge
Standard 1. Higher Order Thinking: Instruction involves students in manipulating information and ideas by synthesizing, generalizing, explaining, hypothesizing, or arriving at conclusions that produce new meaning and understanding for them.

Disciplined Inquiry
Standard 2. Deep Knowledge: Instruction addresses central ideas of a topic or discipline with enough thoroughness to explore connection and relationships and to produce relatively complex understandings.

Standard 3. Substantive Conversation: Students engage in extended conversational exchanges with the teacher and/or their peers about subject matter in a way that builds an improved and shared understanding of ideas or topics.

Value Beyond School
Standard 4. Connections to the World Beyond the Classroom: Students make connections between substantive knowledge and either public problems or personal experiences.

Source: Newmann and Wehlage. (1995). Successful school restructuring. A report to the public and educators. p. 17.

Both the concept underlying situated cognition and the standards for authentic instruction provide an appropriate framework for the discussion of students' perspectives on schooling experiences in programs linking education and work. Program emphasis on learning in occupational contexts and integrating academic and vocational education hold great promises and much can be learned from students' perspectives on instructional approaches and authentic learning experiences.

The research design was guided by grounded theory, a theory that emerges from the rigorous study of available qualitative information describing what is most important for research participants. As such, grounded theory, is inductively derived from the object of study and verified through systematic comparison of data and analysis (Strauss & Corbin, 1990). In this approach, the researcher is not set to test hypotheses but to allow issues relevant to the topic of interest to emerge freely guided only by broad major research questions. This research design is appropriate for documenting students' perspectives on schooling experiences and permits the generation of a grounded theory which evolves from the data in patterns that can be verified through further testing and analyses (Glaser & Strauss, 1967; Strauss & Corbin, 1990).

Method: Research Design

To ground students' perspectives on schooling experiences of interest we examined interview transcripts of students enrolled in five high school programs featuring current education reforms. The key curriculum components of these programs include the requirements of situated cognition, namely, apprenticeship opportunities, practice, coaching and mentorship experiences, collaborative learning, emphasis on critical thinking, and integration of learning skills. These components are part of the concept underlying emerging career-oriented education promoted by the Perkins Act Amendments of 1990 and the School-to-Work Opportunities Act of 1994. The

17

principles of situated learning are embedded in this emerging vocationalism and implemented through: (a) integration of academic and vocational education, (b) articulation of secondary and postsecondary learning, and (c) connecting activities between school and work (Hayward & Benson, 1993; Phelps, 1992; United States Congress, 1994). Detailed description of these three levels of integration can be found in several research reports published by the National Center for Research in Vocational Education (NCRVE, 1993).

The integration orientation and occupational focus of the programs selected for this study provided the frame of reference for grounded interpretation of students' perspectives. Two major research questions were used to guide the study: (a) How do students participating in programs featuring different occupational contexts engage in authentic learning?, and (b) what schooling experiences facilitate the generation of authentic knowledge?

Program Selection

The collective experiences of students in five high school programs constituted the multi-case study approach used in this study. Initially, 33 programs were identified through descriptions in recent national publications, program brochures, or provided via nominations from person knowledgeable of the program(s). These programs were screened for possible selection based on whether the core components of integration mentioned above were present or not. The five selected programs represented urban and suburban locations, and different broadly defined occupational focus (i.e., agriculture, business, science and technology, technical arts, manufacturing). A brief description of each program is presented below.

Agricultural Sciences Program: This is an urban comprehensive magnet school situated in the Midwest, serving 478 students in grades 9-12 representing a mix of ethnic backgrounds. The school offers science, business, and technology with a focus on agriculture in a variety of collegiate and career-bound formats. Extensive curricular opportunities exist in horticultural sciences, food sciences, agricultural careers and leadership, and agribusiness. Opportunities to experience authentic learning are provided in many ways at this integrated vocational and academic campus. Through class projects students hypothesize outcomes, gather and analyze data, and report their findings. Further, internship experiences are available for students at the city's board of trade and at the state university.

Business Program: This urban magnet high school located in the West coast began in late 1981 as a partnership between the school district, business community and local government. In 1991, the school added a fashion component to its curriculum with the support of local industries and trade college programs. This high school affords students an opportunity to experience a business-like school climate. Approximately, 865 students enrolled annually and about 86 percent participate in the business component (data from Spring 1994). Over half of the students enrolled come from low socioeconomic backgrounds and represent various ethnic groups. Authentic learning activities are emphasized through class projects which require the investigation of a topic, implementation of the project, and oral/written report of findings. Furthermore, applied academics are integrated using practical applications related to the business world. Internships are also available to students based on academic achievement, faculty recommendations, and demonstrated performance and responsibility.

Technical Arts Program: The program in Technical Arts is one of seven at the host school, the only public school in this metropolitan area located in the Northeast. The program is serving students in grades 9-12 and offering technical programs in the following areas: automotive, auto body, baking, carpentry, culinary arts, computer science, drafting and design, electrical, electronics, and graphic arts. The program focus is on basic transferable skills leading to career and college opportunities. Students in the Technical Arts program (n=225) appear to be

18

from low to middle socioeconomic backgrounds and a diversity of ethnic backgrounds (data from Fall 1993). Using the city as a laboratory and various workplace environments, students are provided with opportunities to apply basic and advanced skills. There are also various opportunities available for advanced summer coursework and internship programs at nearby colleges and universities. Concurrently, the program works closely with local corporations, hospitals, and higher education institutions to provide for paid work-based experiences.

Manufacturing Program: This manufacturing youth apprenticeship program began in September 1992 and is housed in a high school located in a predominantly middle class suburban town in the Midwest. This two-county program is supported by a consortium of 16 manufacturing companies and seven high schools and 38 students were enrolled in 1994, primarily of Caucasian descent. Once in the program, students attend the Manufacturing Academy housed in a local company. Here, students receive two hours a day of hands-on instruction on how to operate 30 basic pieces of equipment in a factory-like environment. Apprentices receive monetary support over a 2-year period with scholarships awarded at the end of the first year based on grade point average. Internships are available for students at participant companies where they rotate in various departments to learn all aspects of the industry. Students may go on to a 4-year college or enroll in the local 2-year technical college and earn an associate degree in applied science.

Science and Technology Program: This suburban magnet high school located in the East focuses on science and technology and offers a full-time program for students in grades 9-12. Its mission is to provide a rigorous college preparatory program to students with an aptitude and interest in the sciences and technology. The magnet school receives 2,500 applications for admission from six surrounding school districts annually but only 400 students are admitted. In partnership with business, industry, and governmental agencies, eleven specialized technology laboratories support the scientific research emphasis of the curriculum. During their senior year, students can elect to work with community-based mentors to complete their required senior year research project.

Student Selection

A program liaison facilitated the recruitment of 25-30 potential participants at each site. An average of 16 students was selected from this pool of volunteer students at each program based on a convenient sample of beginners (freshman and sophomore) and completers (juniors and seniors). Students were selected based on gender, ethnicity, socioeconomic background, and disability status. Minority students were over-sampled to include a more representative voice in this study. Overall, the sample was characterized by 61% male and 39% female students. Ethnic representation was 34% African-American, 7% Asian, 23% Hispanic, 3% Native American, and 38% Caucasian.

Data Collection Procedures

Instruments and procedures for data collection were pilot tested in two sites not included in this study. Prior to each interview, we explained our research interest to participants and assured the confidentiality of all information. Semi-structured interviews were conducted using broad questions pertinent to the purpose of the longitudinal study. The inquiry was guided by questions regarding decisions to enroll in the program, kinds of learning experiences found more useful and stimulating, major strengths and weaknesses of the program, and postsecondary plans. Further probing was used to elicit detailed information on critical experiences relevant to the line of inquiry and all interviews were tape recorded with the students' permission. Class observations were also conducted in academic courses (e.g., English, mathematics) and program-specific

19

courses (e.g., computer-aided drafting, agricultural leadership) to take notes on students' interactions with teachers, peers, and mentors and gather further evidence on information previously provided by students. Three rounds of interviews were completed between 1993-95.

Analysis

The first round of interviews completed between November and December 1993 were used for the purpose of this study. A sample of six interview transcripts was drawn from each site based on a 50% male/female representation. A total of 30 interview transcripts were used in the analysis. The analysis was based on a qualitative grounded theory approach involving a systematic comparison of data to identify themes and build a theory. This method involves a comparison of critical experiences or events within broad categories, characterization of each category, verification of theoretical properties (see Glaser & Strauss, 1967, pp. 105-111). The two major research questions guiding this study were central to the analysis of the available information. To document each question it was necessary to compare students' experiences or events deemed important within and across programs, and characterize the students' descriptions and evaluations of these critical experiences or events.

All interview transcripts were first reviewed and coded individually before convening as a team to build consensus on initial categories. After agreeing on initial categories based on guiding questions, we identified experiences and incidents describing in more detail emerging categories (e.g., how students described authentic learning activities). Consistent descriptions critical experiences or events characterizing emerging categories were reached when evidence was found in at least half of the participants within each site and at least three of the five programs.

Findings

Based on students' perspectives on schooling experiences in programs linking education and work, three major categories involved in the generation of students' authentic learning were identified. The emerging categories included activities leading to production of authentic learning, connecting learning to real-world situations beyond the classroom, and development of personal motivation for learning. Findings are illustrated by selected accounts that best typifies the sentiment and perspectives found consistent across programs.

Producing Authentic Learning

Production of authentic learning appeared to be facilitated by the occupational/career context of each program. The occupational/career orientation of the programs, in turn, provided multiple opportunities for formal and informal apprenticeship experiences to students in combination with rigorous instructional activities. Instruction, across all program shared an emphasis on acquiring and exercising higher-order thinking, problem solving, reasoning, and communication skills. Collectively, the occupational context, apprenticeship opportunities, and focus on authentic instruction created an environment conducive to acquiring and producing new knowledge grounded in real-world situations meaningful to students.

Occupational/career context. Common across all programs was an occupational program focus in which authentic learning was grounded. This focus appeared to be a basic requirement around which classroom activities were integrated, to a different extent, in each program due to their unique circumstances, resources, and approach to implementation. For instance, Stefan a junior student in the Technical Arts program explained that the "program combines exploration of several industries in the school and how the city works to understand what

20

goes on around us." Stefan comes from a middle class family of Portuguese descent. He was excited about the diversity in learning opportunities in his program and the focus on hands-on work where individual creativity can bloom. "In this program," he added with enthusiasm, "we spend some time learning what we can do in different shops during our freshman year. In the sophomore year we pick out a shop we want for one term and then we can switch to another one after another term or we can stay there if we want." Kenny, an African American student in his senior year evaluated the program focus by indicating that, "you get hands-on and academic experience, because it's good to incorporate both. In the past people would think that this program was only for learning a trade and that it was not possible to go on to higher education. Actually that's not true because you have to use both hands and mind in this program."

Similar accounts were shared by students participating in the other programs featured in this study. In general, the majority of students viewed the occupational context of their programs as useful for grounding and understanding of knowledge applications in their respective fields of interest (i.e., agriculture, science and technology, business, and manufacturing).

Apprenticeship opportunities. Opportunities to learn from expert individuals (e.g., mentors, workplace instructors, peers) were available in different format in all programs. For instance, students in the manufacturing program spend two hours a day at a Manufacturing Academy learning how to operate different equipment and work on projects under the supervision of a master instructor. Opportunities for practice abound and learning from others occur as students consult with each other or with the instructor to solve problems and complete assigned tasks. "This is how the real learning takes place," observed Jeffrey, a student participating in the manufacturing program. He also noted that the real learning "happens in the school and out there in the real world. It is not just in the classroom but also in a social perspective learning from others in the workplace. Because, if you want to learn from someone else, that person would have to know you and by the same token you should be able to relate to that person at work." Karen, another student in the manufacturing program agreed and offered her own perspective:

" I seem to learn more when I'm at my company than I do in the classroom because I've got experienced people to learn from. They come and explain things to me and ask me all sorts of questions to find what I know. If I don't know, they'll teach me."

The majority of the students agreed that classroom instruction without apprenticeship opportunities limits their enthusiasm for learning because it can become highly predictable. However, students also recognized that academic school work can provide the foundations for lifelong learning and application of knowledge beyond work-related activities. Apprenticeship opportunities were also available in the form of mentorship experiences in which students work closely with professionals in the community. Students would either spend time with their mentors outside the school working on projects of common interest or mentors would come to the school periodically to assist students not only on projects but also on career issues. Working with peers was also another way to establish novice-expert relationships to facilitate the generation of academic knowledge as well as for developing social linkages in the school. These apprenticeship/mentorship opportunities were a common factor across all programs and seemed to create a spirit of cooperation and a community of learners.

Authentic instructional activities. Instructional activities were identified by the majority of students as both rigorous and stimulating. Problem solving, reasoning, and communication skills appeared to be emphasized across programs under various formats given the different occupational orientation and instructional approaches found in each program. Collectively, these learning

21

experiences seemed to facilitate in students an appreciation for generation of new knowledge based on program experiences and individual career interest.

The rigorous curriculum and the emphasis on higher-order thinking is typified by Phil, a senior student in an agricultural program. He had been working on a science project since the seventh grade and continued to research it every year. He found fascinating how much he learned in the area of biochemistry and plant breeding. All along he was challenged to explain his findings, problems encountered, and his thinking. The following is a brief account of how he described his project and his thinking on the subject:

> "One of the problems people have with corn is that it's a seasonal crop. If we have a good season we are usually the leaders in corn production in the United States. But the only time we can produce corn is during the summer time because that's when the conditions are right. Now, if we could only alter the biochemistry of how corn grows by manipulating the genes, we could possibly increase the average yield. The process of growth takes about three months... so if we could expand the growing season not in winter weather but at least through the fall, maybe we could eat corn on the cob in the winter time. It is a matter of isolating the right genes and that's what I'm looking into."

Carol, a student who was working on her senior research project in the Science and Technology program, provided another account of the rigor and higher-order thinking embedded in instructional activities. "My group will be doing a prosthetics project if our teacher approves it. We plan on doing an exploration of what prosthetics will look like in twenty years. We will track the history of prosthetics and then we will spin off in our science project to link with the robotics lab to come up with a prototype of something that might be used in the future. The robotics lab has some muscle wire for artificial arms and we plan on doing a bioengineering project to connect science history to practical applications which may be used in the future in the area of prosthetics engineering." In these projects and authentic activities, students are required to manipulate available information, refine their own ideas, synthesize data, make conjectures, explain their thinking, and make meaningful conclusions to produce new understandings and relations to practical applications.

Deep knowledge is facilitated by the disciplined inquiry required to complete projects either in the classroom or in work-based environments. This process can be best described by Dale's insights on the things involved in one of his projects. He talked about making small parts with the right dimensions and being careful not to run the machines too fast because "it gets too hot and the tool bit will break." However, he added that "if you run the machines too slow, then you're losing money for your company. So you really have to figure out what your spindle speed is and everything before you start working on anything." To develop such an understanding of the optimum conditions for operation of equipment, the need for quality control, and the implications for the company's success beyond the mere production of parts, required of him deep knowledge of the topic at hand. It also required thorough knowledge of academic and practical skills connected with making parts and a complex understanding of the repercussions of his performance. "It is not all cut and dry," he observed, "you have got to use your head a little more often to understand what's going on instead of looking in the book to find the answer."

Instructional activities were also described by students as flexible and supportive of exchanges with the instructor or other students. "The most important thing at this school is trust," said Leslie, a sophomore student in the Science and Technology program. "The students get so much trust and respect at this school that it is just a whole different atmosphere than you'd ever imagine anywhere else. What makes a difference is the energy that comes from the students

because all of us are so intense working on different projects. So we bring energy and life into the classroom and to the different assignments." Other students agreed on the importance of quality classroom interactions and complained that certain instructors would only focus on the top students of the class. Cleo's comment, a student in the manufacturing program, perhaps best typifies the consensus of students across all programs. "Just being able to talk to other people in the classroom and at our internship places, people who are willing to give their knowledge and skills to me, make me strive to do better." Wally, a Technical Arts student, reinforced this notion by saying that "teachers need to get us involved in class conversation if we want to learn." He offered the following example:

> "In an English class we had videotapes on drugs and we did a lot of presentations on problems with fights and other school problems. And the class got all the students involved. That was the first time I enjoyed a class because I learned from different points of view and had the opportunity to share mine."

Through these instructional practices focusing on authentic learning activities, students had the opportunity to engage in problem solving (e.g., making parts), experiment, conduct research, make sense of available information, reason and explain their thinking, and communication of findings or ideas to others formally or informally via oral/written reports. The results are obvious in the accounts provided by students. They spoke thoroughly and in depth about different topics addressed in class projects, were articulate in their understanding of learning experiences, and were able to explain knowledge derived from such experiences. Indeed, a departure from rote memorization of facts and figures.

Connecting Learning to Real-World Situations

Another important aspect of authentic instruction common to all programs was the opportunity for students to make connections to real-world situations either by developing and understanding of broad applications of knowledge and skills or by actually participating in work-based situations. By connecting school and work, all of a sudden academic knowledge took new meaning for some students. A powerful discovery of the usefulness of otherwise dry subject matter such as geometry and chemistry. Patricia, a student in the manufacturing program, marveled when thinking about the time she made this discovery:

> "The math teacher was explaining angles and related material and I started to relate it to the parts I was making in the Manufacturing Academy. It really surprised me because I'd be sitting there thinking 'yes, I can relate to that.' So that makes the class more exciting because most of the kids who are not part of the manufacturing program would just stare at the teacher going through this mechanically but not being able to relate it to anything. But for me, it changed my perspective, It really helps me to understand geometry much better when I can relate it to something I know."

Julian, a senior student in the business program, argued that the opportunity to actually do authentic work either in the classroom or as part of internships helped him not only understand better the language of the business world but it gave him a whole picture of what it takes to run a business. These connections of academic and practical knowledge to real-world situations were also possible through participation in internships and other forms of work-based learning available to students in all programs. Through work-based connecting activities, students are able to learn

23

about various aspects of industries of interest and develop an understanding beyond the mere application of practical skills. Students consistently mentioned the connections they were able to make with the human factor (e.g., co-workers, professionals, mentors) in these work interactions and develop social knowledge related to the culture of occupations and corporations.

Developing Intrinsic Motivation for Learning

An added value to having an occupational program focus, authentic instructional activities, and opportunities for students to connect school and work-based learning is the development of intrinsic motivation to learn. Stimulated by the challenges of rigorous curricula, higher-order thinking activities, and application of knowledge in real-world situations, students appeared to gain an appreciation for academic knowledge and the possible benefits on career plans upon graduation from high school. Rhonda—a student in the agricultural sciences program, for instance, feels motivated because, she said, "I know a lot more things than kids at other high schools in the area. I have the same classes as other high school students but with these agriculture classes it's like added value on education. This was not important when I was a freshman, but now that I know more about going out in the real world, I know these agricultural knowledge will come handy in the future." Other students, like Julian, get motivated by the potential career opportunities his high school program will provide for him: "By seeing how bad the economy is, how hard you have to work just to eat, and how difficult it to progress economically, that is what motivates me to work hard now. I'd like to learn the most I can to get more knowledge that will be useful in the future."

The synergy generated by the school culture and curriculum orientation also appears to contribute to the motivation of students. "I think the school orientation [program focus] definitely has a positive impact on you because you are around people with same interests," noted Edward, a science and technology program student. In such an environment, Paul, another science and technology student, added that "you are challenged and actually learn a lot of practical and academic skills which can be very useful in college."

Discussion and Conclusions

The findings of this study offered no surprises regarding the positive benefits of situated cognition strategies on students learning. Other studies have found similar positive contributions of situated cognition instructional strategies in a variety of settings and circumstances (see for example Black & Schell, 1995; Evanciew, 1994; Griffin, 1995). What is worth noting here is that positive evaluations of participant students addressed not the testing of isolated testing of situated cognition methods or artifacts but an overall approach embedded in programs linking education and work. The authenticity of a variety of learning experiences connecting school and work in an occupational context seems to provide an excellent medium that facilitates student engagement in the acquisition and production of new knowledge. Through apprenticeship opportunities occurring formally and informally in and out-of-the school, students enjoy the benefit of learning from experts in their field of interest, advanced students, and other individuals playing different roles in their preparation.

Authentic instructional activities emphasized in both school and reinforced through work-based learning activities appear to be critical to the success of career-oriented programs and to the quality of student learning. Newman and Wehlage (1995) argued that not all practical experiences are necessarily authentic and many of the students' descriptions of instructional activities reflected low level of authenticity. However, across all programs students' perspectives on instructional activities suggested high levels of authenticity by involving higher order thinking skills, emphasis on in-depth knowledge, and opportunities to research, solve problems, and

24

communicate findings to peers and work site mentors. The validity of these claims can be an important point for discussion since no classroom observations were conducted to specifically verify the quality levels of authentic instructional activities. Overall, however, there seem to be plenty of opportunities for high levels of authentic instructions (e.g., senior research projects, manufacturing projects, experiments) across all programs thanks to a highly visible occupational/career focus. Collectively, these instructional activities promote active learning, facilitate production of new knowledge, and engage students in stimulating courses of learning that are anything but boring.

Two additional benefits were identified in the form of meaningful connections students make regarding the application of knowledge to real-world situations and development of personal motivation to take responsibility for own learning. Students appear to develop sophisticated understandings of how the world of work works and the implications for applying academic and practical skills beyond production processes. Through these complex understandings, students seemed to develop intrinsic motivation in the form or appreciation for academic subject matter, practical applications, and the expectation of future benefits to career plans.

In light of these findings it is necessary to ask some critical questions as career-oriented programs become commonplace around the nation. First, given the increasing but varying levels of academic rigor observed in these programs, how do we ensure equal access and opportunity to learn for all students as promised by education reforms undergirding these programs? Second, because of the complexity of implementing true authentic instructional activities, how can we assure high levels of authenticity both in school and work-based learning settings? Third, how can we build a community of learners including employers, where apprenticeship opportunities in the workplace become a rigorous learning experience grounded in real work practices instead of specific preparation for jobs? These and other related questions need to be addressed if we are to provide challenging curricula linking education and work to all students.

The standards for authentic instruction (Newman & Wehlage, 1995) and the National Council of Teachers of Mathematics Standards (NCTM, 1989) offer excellent frameworks to guide efforts in developing integrated authentic curricula by envisioning content, pedagogy, and assessment as integral components of teaching and learning. The challenge lies in bringing administrators, academic and vocational instructors, and employers together for curriculum development purposes. A daunting task indeed, but a task deserving serious consideration.

References

Bailey, T. (1991). Jobs of the future and the education they will require: Evidence from occupational forecasts. *Educational Researcher*, 20(2), 11-20.

Black, R., & Schell, J. W. (1995). Learning within a situated cognition framework: Implications for adult learning. (Paper presented at the 1995 meeting of the American Vocational Association, Adult Vocational Education Division. Denver, CO)

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.

Cognition and Technology Group at Vanderbilt. (1993, March). Anchored instruction and situated cognition revisited. *Educational Researcher*, 33(3), 52-70.

Evanciew, C. E. P. (1994). Emerging themes in youth apprenticeship programs: A qualitative study. (Paper presented at the American Vocational Education Research Association Division of the American Vocational Association, Dallas, TX).

25

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aladine.

Gregson, J. A. (1994). Posing problems to raise student consciousness about values, attitudes, and worker responsibilities: A democratic possibility. *The Journal of Vocational Education Research, 19*(4), 13-35.

Griffin, M. M. (1995). You can't get there from here: Situated learning, transfer, and map skills. *Contemporary Educational Psychology, 20,* 65-87.

Hanks, W. F. (1992). Forward. In J. Lave and E. Wenger. Situated learning. *Legitimate peripheral participation*. New York: Cambridge University Press.

Harley, S. (1993, March). Situated learning and classroom instruction. *Educational Technology, 33*(3), 52-70.

Hayward, G., & Benson, C. S. (1993). The changing role of vocational-technical education in the United States. *Center Work, 4*(2), pp. 1-3. National Center for Research in Vocational Education, University of California at Berkeley.

Heebner, A. (1995). The impact of career magnet high schools: Experimental and qualitative evidence. *The Journal of Vocational Education Research, 20*(2), 27-55.

Hernández-Gantes, V., & Phelps, L. A. (1995). The impact of career-oriented programs on postecondary aspirations: A qualitative study of students' perspectives. (Paper presented at the American Vocational Education Research Association Division of the American Vocational Association, Denver, CO).

McLellan, H. (1993, March). Evaluation in a situated learning environment. *Educational Technology, 33*(3), 39-44.

McLellan, H. (1994, October). Situated learning: Continuing the conversation. *Educational Technology, 34*(8), 7-20.

National Center for Research in Vocational Education. (1993, April). *The 1993 agenda for the National Center for Research in Vocational Education*. Berkeley: University of California at Berkeley, Author.

National Council of Teacher of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.

Newman, F. M., & Wehlage, G. G. (1995). *Successful school restructuring: A report to the public and educators*. Madison, WI: Center on Organization and Restructuring of Schools.

Pauly, E., Kopp, H., & Haimson, J. (1995). *Homegrown lessons: Innovative programs linking school and work.* San Francisco: Jossey-Bass.

Secretary's Commission on Achieving Necessary Skills (1991). *What work requires of schools: A SCANS report for America 2000*. Washington, DC: U.S. Department of Labor.

Smith, H. (1995). *Rethinking America*. New York: Random House.

Stasz, C., Kaganoff, T., & Eden, R. A. (1994). Integrating academic and vocational education: A review of the literature, 1987-1992. *Journal of Vocational Education Research, 19*(2), 25-72.

34

Strauss, A. L., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Suchman, L. (1987). *Plans and situated actions*. New York: Cambridge University Press.

Tripp, S. D. (1993, March). Theories, traditions, and situated learning. *Educational Technology*, 33(3), 71-77.

United States Congress. School to Work Opportunities Act of 1994 (P.L. No. 103--239).

William T. Grant Foundation. (1988). *The forgotten half: Non-college youth in America*. An Interim Report on the School-to-Work Transition. Washington, DC: William T. Grant Foundation, Commission on Work, Family, and Citizenship.

Wirth, A. G. (1992). *Education and work for the year 2000: choices we face*. San Francisco: Jossey-Bass.

35

Generic Skills At Work: Implications for Occupationally-Oriented Education

Cathleen Stasz
RAND

Introduction

Changes in the modern workplace brought about by technology, management innovations, and increased competition in the global marketplace, have led to many concerns about the adequacy of workforce skills. Work organization, for example, is increasingly characterized by the integration of traditionally separate functional roles (e.g., design, engineering, manufacturing); flatter organizational hierarchies with decentralization of responsibility, and greater employee involvement. Innovation and speed are accomplished through teams of workers who monitor quality and take charge of reconfiguring the production process, thereby performing some of the supervisory, planning, repair, maintenance, and support functions previously done by managers or specialists. Compared to the traditional model of work, based largely on mass production, this new "flexible" model is thought to require less supervision, but workers with higher and more varied skills (Berryman and Bailey, 1992).

In the U.S. and elsewhere, the discussion often emphasizes the need for generic skills in addition to jobs-specific skills and domain expertise. The dominant source of evidence that workers need new job skills comes from employer surveys and interviews. Natriello (1989), for example, reviewed 14 studies of employer needs that focused on entry-level workers. He found that employers most often cited the importance of employee attitudes, followed by an emphasis on "generic" skills such as problem-solving and communications over job-specific skills. And in a recent national survey, employers ranked applicants' attitude and communication skills as the most important factors in hiring decisions (National Center on the Educational Quality of the Workforce, 1995). The conclusion that employers seem relatively satisfied with workers' technical skills but see a need for increasing generic skills and/or improving workers attitudes or dispositions has been corroborated in a number of studies (e.g., Bikson and Law, 1994; Hudis et al., 1992; Cappelli, 1992).

The perceived "skills gap"—the mismatch between the existing workforce skills supply and the skill demands in the new workplace—has several implications for occupationally-oriented education. It raises basic questions about the content of educational programs, including what skills should be taught and how schooling should be organized to teach them. However, as we discuss below, educators face several challenges in answering these questions. They are hampered by the lack of consensus on the definition and measurement of new skills, and by organizational and other barriers that challenge the implementation process.

This paper takes a sociocultural approach to examine generic skills in the context of technical work. It focuses on three skill areas—problem solving, communications, and teamwork—which both educators and employers identify as important. The study on which the paper is based examined several questions:

> What generic skills are evident in technical work?
> How do workers conceive of them?
> How do skills vary across jobs and work contexts?
> What perceptions do employers have about their skill needs?
> What are the implications for occupationally-oriented education?

28

In response to calls to reform education to better prepare America's youth for the future workforce, many proposals and activities are on the table which redefine what skills students should learn and how they should be taught. Reforms often advocate significant changes to the curriculum such as integrating academic and vocational education, teaching "all aspects" of the industry, and teaching general skills (e.g., problem solving, communication) in addition to purely academic or vocational subjects. Following new models of learning advanced by research in cognitive science (Stasz et al., 1993; Collins, Brown, and Newman, 1989; Raizen, 1989), reformers also advocate different approaches to classroom instruction, such as student-centered instruction, small-group and cooperative instruction, and project-based learning. In addition, some argue that school-based learning should be integrated with work-based experience because some skills can best be learned on the job (Bailey, 1993; Kazis, 1993).

While these proposals are not all new to vocational educators, they still present several challenges to program developers and implementors. First, the content of academic curricula are generally organized by subject area and vocational instruction is often job-specific This organization focuses instruction within a domain and emphasizes the development of knowledge and skills particular to that domain. Second, the reforms add work-related attitudes or dispositions to the list of competencies that students should acquire. Attitudes and dispositions are inevitably tied to beliefs and values, which schools often avoid teaching explicitly for a whole host of reasons. Third, most proposals fail to sufficiently specify how to turn recommendations for new curriculum content and pedagogical practices into instructional design strategies. This is particularly problematic for reforms that emphasize project-based or applied learning approaches where students learn and practice skills in "real-world" or "authentic" contexts. Teachers are typically trained and certified to teach along disciplinary lines. They have little opportunity to observe work contexts outside of school or otherwise gain the knowledge they need to contextualize teaching in ways that reformers envision (Stasz et al., 1993). It is clear that many of these "school-to-work" reforms require closer collaboration between employers and education providers. Employer participation is sought to provide information about knowledge and skill demands, to assist in curriculum design, and to provide work-based learning experiences to students and even to teachers. The success of many reforms will depend on the strength of these collaborations or partnerships; yet we have little empirical evidence on the incentives that might encourage employer participation or employers' ability to fill the multiple roles expected of them (Bailey, 1995).

Defining New Skills

Especially problematic for school reformers is the lack of a clear and common conceptual framework for defining and assessing skills. While several conceptions of new skills have been put forward, two will serve as illustrative examples. One conception, offered in a recent book by Marshall and Tucker , sums up "the emerging consensus on the skills needed to power a modern economy" (1992, p. 80) as follows: a high capacity for abstract, conceptual thinking; the ability to apply that capacity effectively to complex, real-world problems that may change as jobs evolve; the ability to communicate effectively, particularly when communicating within work groups, on highly technical topics, and with computer-based media; and the ability to work well with others as well as independently, with relatively little supervision.

Another conception is presented in several influential reports issued by the former Secretary of Labor's Commission on Achieving Necessary Skills (SCANS, 1991; 1992a; 1992b). SCANS defines three "foundation skills " (basic skills, thinking skills, and personal qualities) and five work "competencies" that effective workers can productively use (resources, interpersonal skills,

29

information, systems, and technology) (SCANS, 1991). In the SCANS framework, competencies and foundations are generic, in the sense that "most of them are required for most jobs" (SCANS, 1992b) and are distinct from technical knowledge (SCANS, 1991).

In addition to lacking consensus on the definition of "new" skills, the traditional concept of "skill requirements" and ways of measuring them are also being questioned. The concept of skill requirements is generally used to analyze both the characteristics of jobs (e.g., tasks, roles) and of the individuals who perform them (e.g., aptitudes, abilities, characteristics) (Attewell, 1990; Darrah, 1994; Spenner, 1990). Jobs are broken down into tasks to establish what individuals will need to know and do in order to perform them. Job "requirements" are often narrowly defined lists of tasks and skills which, in turn, become qualifications for hiring or prescriptions for education or training activities designed to prepare individuals for the job. Filling the "skills gap" is an exercise in matching people to jobs.

This concept of skill requirements and the methods for assessing them, however, largely ignore work context—the workplace is seen as a backdrop to individual actions. Absent is the idea—born out in many studies of actual work—that workplaces are shaped by human choice and by the actions taken by those who work in them (Darrah, 1992; 1994; Scribner and Sachs, 1990; Billett, 1993; Lave and Wenger, 1991; Orr, 1991; Barley, 1995). Characteristics of the workplace can also structure action—i.e., work processes, technology in use, incentives and disincentives for workers to learn and use skills. Learning work is not just a process of internalizing knowledge and skills "required" on the job, but a social activity.

An analysis of skill requirements that ignores work context may be inadequate for assessing skill needs in the flexible workplace (Bailey and Merritt, 1995; Hanser, 1995). In addition, a traditional conception of skills has helped shape a one-sided public discourse which blames the "skills gap" on individuals who lack skills and on educational institutions that fail to adequately teach them. It focuses policy on reforming schools or creating standards for individuals to achieve and pays less attention to workplace reforms that might improve skills and productivity (Stasz et al., 1996).

Conceptual Approach and Methods

The goal of the research reported here was to improve the understanding of skills as they are constituted in technical work, both by extending theoretical conceptions of skills and by providing empirical observation of skills in practice. We also wanted to improve the understanding of the institutional context in which working activities—particularly learning on-the-job—take place. This is necessary because we take a sociocultural perspective (e.g., Vygotsky, 1978) which views skills as a feature of the workplace as a social system, and not just features of individuals or jobs.

We used a multisite, replicated case study design where similar sets of criteria were used to select participating firms and individuals within them, and where common data gathering procedures were employed across the sites (Yin, 1994). Our study sample included sites in four firms that represent different business areas in Los Angeles county: a transportation agency (TA), a traffic management agency (TM), a microprocessor manufacturer (MPM), and a health care agency (HA). The sizes of the firms, in terms of personnel, range from 26 people to tens of thousands. Two firms, TM and TA, are public agencies, while the other two are private Three have service functions, while one (MPM) is a product manufacturer. They also serve markets of varying scale, from local (TM), to regional (TA), national (HA), and international (MPM). Most of these sites were feeling the pinch of austerity. Almost all the workers we observed were facing rapid changes in technology and in the way their work was done. In addition, three firms had begun using new management practices such as total quality management (TQM), continuous

30

quality improvement (CQI), or organizational learning to guide restructuring of many aspects of their operations.

At these four work sites we studied skills in practice in seven service and manufacturing jobs in the sub-baccalaureate labor market: (1) Traffic signal technicians working in the traffic management agency; (2) Home health aides and licensed vocational nurses (LVNs) in the health care agency; (3) Test cell associates and equipment technicians in the microprocessor manufacturing firm; and (4) Construction inspectors and survey inspectors at the transportation agency.

Over several days we observed the everyday activities of individual workers and their community of practice and interviewed them to obtain information about their backgrounds (e.g., previous education and training experiences), and current job and work experiences. We also conducted interviews with senior managers, staff, line managers, and human resource personnel in order to obtain information regarding each firm, including its perceived skill needs and its policies for acquiring and developing workforce skills (See Stasz et al., 1996 for a detailed discussion).

Analytic Procedures

Following procedures developed in our earlier research (Stasz et al., 1993), the analytic phase of the field study involved an iterative process of indexing observational data, domain analysis, and generation of themes. We developed index categories that corresponded with the dimensions of work context used to structure the formal interviews, and on other study goals (e.g., worksite connection to schools). As fieldwork commenced, we built on the initial domains by adding categories that emerged at different sites.

Field workers coded interviews and observation notes, which were entered into a computer program for managing text data. To achieve reliability in coding, each fieldworker indexed several sets of fieldnotes and interviews written by other fieldworkers. As a group, the study team compared results, clarified definitions and identified any missing categories.

Once our preliminary analysis was completed, we returned to each worksite to debrief the study participants on our interpretations of the results and preliminary findings. The debriefing provided a validity check for our findings and gave study participants the opportunity to discuss the implications of the findings for their worksite.

Defining Generic Skills

At present, there is no standard definition of generic skills, and the roles of general and context-specific knowledge in thinking is still a puzzling issue in social science. Studies of expertise from a cognitive science perspective support findings from sociocultural studies and suggest that general skills do not take the place of domain-specific knowledge, nor do they operate exactly the same way from domain to domain. Rather, specific applications of the general need to configure to the context (e.g., Perkins and Salomon, 1989).

In this study, we began with a conception of generic skills developed in our previous research (Stasz, McArthur, Lewis, and Ramsey, 1990; Stasz, Ramsey, Eden, DaVanzo, Farris, and Lewis, 1993). These defined two broad categories of generic skills: basic or enabling skills, such as reading and simple mathematics; and complex reasoning skills, which includes solving both formal and everyday problems encountered in school or work. We also include work-related attitudes or dispositions, such as cooperative skills or personal qualities (e.g., responsibility, sociability) that can affect learning and performance on the job. This conceptualization is similar to the three-part foundation skills identified by SCANS (1991) that has gained broad acceptance in both education and business communities.

31

The focus of the analysis reported here is on problem solving, communications, and teamwork. As discussed earlier, we emphasize these areas over others because of the general consensus that these capabilities are lacking in the workforce and that improving them requires public policy action.

Problem solving at work. Studies of cognition from a symbolic processing approach examine how problems are symbolically represented and manipulated and often yield detailed analyses of problem characteristics, such as start states, goal states, constraints, and operators (e.g., Anderson, 1983; Newell and Simon, 1972). These studies are limited for our purposes because they typically study well-defined problems in laboratory or artificial settings rather than in real work contexts. Problems at work tend to be ill-defined, often unrecognized as problems, and have many possible solutions and solution methods (Lave, 1988). This research also typically focuses on individuals, and ignores social aspects of problem solving.

For the purposes of this study, we are interested in a characterization of problem solving as it broadly defines work practice in each job, rather than providing a detailed breakdown of knowledge or procedures used to solve particular problems encountered (e.g., repairing a machine, diagnosing a patient's symptom). These broad themes should reflect the collaborative or interactive aspects of the work and the situated nature of problem-solving activities.

Teamwork. Many discussions of new skill requirements in the work force mention teamwork as a necessary skill. As Darrah (1992) points out, teamwork is not a "skill," but a description of how work is organized. What constitutes a "team" is subject to local definition and thus must be defined in relation to the working context. Thus, the "skill" or "interpersonal competency" needed to participate in a team will depend on the work organization. Relevant definitions of work organization from organizational behavior and sociocultural literature include self-managing versus co-acting work groups (Hackman and Oldham, 1980; Levine and Moreland, 1991); distributed knowledge (Hutchins, 1991), and communities of practice (Lave and Wenger, 1991). Our analysis draws on these definitions to first examine the organization of work and then to discuss implications for participation in different work organizations.

Communications. Communications skills are widely cited as among the most important skills needed by today's workers. But communications is a broad term that can be ambiguous in its meaning. Unfortunately, this ambiguity is seldom taken into account when discussing communication skills on the job. Few would disagree, for example, that individuals who deal with the public (e.g., salespersons, flight attendants) may need different communications skills than more solitary workers, yet few discussions about communication skills make specific distinctions about how communication needs might vary from job to job.

Here, a traditional analysis of communications is adopted that focuses on four axes: audience, or who is communicated with; purpose, why they are communicated with; style, the way in which the communicator presents himself or herself; and mode, the means by which the communication is accomplished. In addition to being familiar to instructors and trainers who may want to draw on our findings, this framework has the advantage for our purposes of focusing on the situated nature of communication skills.

Skills in Practice

Turning to the study findings, we observed these generic skills to be important in work and found this importance to be salient to the workers. Our interviews and work observations enabled us to see how workers actually apply skills in practice in the context of their jobs, communities of practice, and work settings. However, we found that required skills can vary substantially by these contexts. Employers did not always appear to understand specifically how skills are instantiated on the job.

32

Problem Solving

We were able to analyze how workers solve both routine and atypical problems and how problem solving is construed by their community of practice. For example, construction inspectors understand problem solving in their work in the context of quality assurance and control. A typical inspection problem occurs when an inspector identifies some discrepancy between the specifications and the construction and then must pinpoint the source of the discrepancy and determine how to get the error corrected. Survey inspectors view problem solving similarly. As one inspector put it, "the nature of surveying, though, is that there are constantly new problems to solve." However, unlike any of the other jobs we studied, survey inspection requires mathematical problem solving. A large portion of the crew chiefs' job is calculating the exact horizontal and vertical placements of objects in the field from two-dimensional plan specifications.

By contrast, problem solving for the home health care worker and the LVN is primarily "situation assessment." The worker is the "eyes and ears" of an extended patient care team, where each patient represents a unique "problem" that needs resolution. The home care workers must gather information about the patients' condition to report back to the case manager, who can determine if the patients' condition warrants other than currently prescribed action. Importantly, the health workers must also assess and interpret the patients' condition in the home care context, and educate patients and household caregivers in ways that assist proper treatment.

For the equipment technicians at MPM and traffic signal technicians who maintain and repair electronic equipment, problem solving mostly means troubleshooting. When the equipment or system breaks down, they must know how to troubleshoot—to identify the problem and fix it. The work context of each job places different constraints on troubleshooting. Traffic signal technicians' work pace is variable, ranging from routine maintenance work in the shop to outdoor emergency repairs in inclement weather. At MPM, technicians work with sensitive equipment in "clean room" conditions, where the manufacturing technology changes every six months, and where a small electric shock can burn a hole in a chip that might affect the performance of a multimillion-dollar satellite.

Communications

Required communications skills varied similarly (see Table 1). An important distinction for front-line workers was internal versus external audiences, i.e., members of their own firms versus members of "the public," including their firm's customers. For example, communication with patients and their families was a central part of the job of home health providers. Traffic signal engineers working in the field often had to communicate with motorists, the "customers" of the traffic signal system. However, with the possible exception of home health aides, most workers communicated chiefly with internal audiences—members of their work group, other co-workers, and supervisors. Finally, the workers in our study communicated with audiences who were single individuals or small groups.

In both speech and writing, by far the most common purpose for which the workers we studied use communications skills was to convey an appropriate fact accurately. Home health providers reported on the status of patient functioning and log their own activities, including facts such as mileage driven. Survey inspectors called out measurements. The second most common purpose was to convey procedural information—instructions. Accuracy, speed, and clarity are highly valued. An amicable and professional demeanor was highly valued in all spoken communications. Such a demeanor was perceived to improve the ability and willingness of the listener to engage in communication. This was particularly important on jobs that required the worker to communicate directly with the public.

Table 1
Communications Activities by Job

Job	Audience	Purpose	Style	Mode
Home health workers	•Patients and family members •Other health care professionals	•Elicit and provide information •Provide instructions	•Amicable professional demeanor	•Face-to-face conversation •Telephonic conversation •Written records
Traffic signal technicians	•Other traffic signal engineers •Workers in other departments •Motorists •Courtroom participants •Supervisors	•Provide information •Provide instructions •Request assistance	•Amicable yet professional demeanor with public •Fluent English important	•Face-to-face conversation •Radio transmission •Testimony •Written records and forms
Construction inspectors	•Other inspectors •Contractors and construction workers	•Provide information •Provide instructions •Negotiate	•Amicable yet professional demeanor •Bilingual Spanish/English useful	•Face-to-face conversation •Written reports
Survey inspectors	•Other survey crew members •Construction workers	•Provide information •Provide instructions	•Collegial manner	•Face-to-face conversation •Meetings •Radio transmission
Test cell associates	•Other test cell members •Selected workers in other units	•Provide information •Schedule tests •Provide assistance with procedures	•English speaking less important because cells are grouped by primary language of most members	•Face-to-face conversation •Tracking sheets
Equipment technicians	•Other test technicians •Operators of machinery	•Solve problems collectively •Provide instructions on how to use machines		•Face-to-face conversation •Operating instructions •Written logs (hardcopy and on-line)

Teamwork

Teamwork is a description of how work is organized. Three overlapping aspects of team or group work that illustrate a variety of team arrangements and require different worker skills and behaviors were identified (see Table 2).

Table 2
Characteristics of Work Groups

Jobs	Autonomous/ Self-Managing	Distributed Knowledge	Independent Work
Traffic signal technicians			•Shop work •Team for short-term problem solving (e.g., emergencies)
Home health aides/LVNs		•Patient care team with many specialists •Distributed authority	•Patient care in home
Test-cell associates	•"Leaderless" team		•Independently perform tests
Equipment technicians		•May specialize in particular machines	•Independently repair and maintain machines
Survey inspectors	•Chief manages crew	•Chief plus two instrument men	
Construction inspectors		•Construction specialty	•Independent inspection, but informal, "virtual" team

A self-managing work group, for instance, is an intact and definable social system, with a defined piece of work and authority to manage the task on its own. This traditional conception of self-managing work groups generally characterizes team work in two jobs: survey inspectors and test cell associates. A second important characteristic of the work teams is the distribution of knowledge, skills, and sometimes authority, among individuals. Teams can be formally recognized and supported by the organization, or informally constituted by team members themselves. The survey inspector team, for example, is comprised of individuals of different rank and skill, with party chief as the acknowledged leader. Home health providers are members of a large managed-care team, which can include doctors, nurses, physical therapists, or other health specialists. This team is characterized by both distributed knowledge and authority linked to special certification. Construction inspectors operate as members of a "virtual" team that is not a formal entity in the organization, but a creation of this community of practice. Inspectors are responsible for their own special area (e.g., concrete, electrical), but are also on the alert for activities in the other specialties. They communicate potential problems or issues with each other by radio, which helps improve the quality and efficiency of their work. Traffic signal technicians and test technicians (MPM) work independently for the most part, they but may form field teams for short-term problem solving or specific activities.

Employer Perceptions of Skill Needs

In addition to observing and talking about skills with workers, we asked managers, supervisors, human resources specialists, and trainers about skills in target jobs and reviewed relevant documents (e.g., job descriptions, training plans). Our object was to determine how well employers' and employees' perceptions matched, and how firms set about acquiring and developing

35

workforce skills. Our work observations also provided information about learning on the job, which seems especially important for school reforms advocating work-based learning. Since proponents of work-based learning believe that workplaces can provide educationally relevant experience for youth, it seems useful to know about workplaces as learning environments for nonmanagerial workers. At present, we know that most formal, firm-based training goes to managerial, sales, and professional workers (Lillard and Tan, 1986; Vaughn and Berryman, 1989) or emphasizes specific skills development rather than broad training in generic skills (Rogers and Streeck, 1991).

Three findings from our analysis of employers' perceptions of skill needs and their policies for developing skills are particularly relevant for occupationally-oriented education. First, management does not always understand the specific skill requirements of their front-line workforce. Managers far removed from the front-line workforce sometimes underestimate the capabilities of workers or had very different opinions about work requirements. Transportation agency managers, for example, appeared to underestimate the capabilities of their front-line workforce to carry out planned changes to adopt total quality management (TQM) practices because they were not familiar with the quality control nature of inspection work. At the microprocessor manufacturing firm, test cell associates work in flexible, autonomous teams where technicians made their own decisions about the work flow and where work activities and technology were often changing. However, although the test cell associate job is a good example of work under the "flexible," high-skill model, human resource staff viewed it as repetitive and somewhat low-skilled. In contrast, managers and supervisors who came up through the ranks are more articulate about specific skill requirements and have a sense of which capabilities could "make or break" success on the job.

Second, we found that some employers do little to foster skill development among non-managerial workers, and in some instances they take courses of action that actually undermine skill development. Employers and employees in all the firms felt that training on the job was essential to really learn the job in the first place or to keep up with the pace of change. But only two —the health care agency and the microprocessor manufacturing firm—made any significant investment in formal training. In these firms, dedicated trainers, training classes, career paths linked to acquiring higher skill levels, and other policies indicate a commitment to training.

Other firms had policies that might contribute to skill development, but these were not always successful. The job rotation policies to support training for traffic signal technicians were, by management's own admittance, not always followed. And techs had little regard for the few opportunities they had for vendor training, which they saw as primarily sales pitches. Policies to attain certification (for construction inspectors at TA) or to gain technical knowledge and skills (for traffic signal techs) were only partly supported, through reimbursement or time off the job. Since job-related course taking did not affect workers salaries, not every tech was motivated to invest in further education and training. Managers in firms making fewer training investments— transportation construction and traffic management—expressed openly their frustration in having few training resources, but seemed resigned to do what they could with what they had.

Even when formal, firm-sponsored training is absent, however, workers obviously continue to learn on the job. Structured on-the-job training is a prominent strategy which originated in the tradition of craft apprenticeships. In our study, OJT was carried out within communities of practice that often take up the slack where formal training is either not provided or fails. For survey inspectors, the training provided by the union and by other crew members on-the-job was the only conceivable way to learn and grow as a surveyor: surveyors believed OJT was superior to any classroom training. The expectation that inspectors would train themselves (beyond what they learned in union school) was the norm for both survey inspectors and construction management.

36

In contrast, the community of practice that supported training of traffic signal technicians and construction inspectors was not always visible to higher management. In some cases, management policies seemed to undermine, rather than support an atmosphere where experts readily introduced and guided newcomers in the work. For example, lack of supervision and little accountability created two communities of practice for signal technicians: the "A" team, who are conscientious about the work and eager to help newcomers gain expertise, and the "B" team, who are less motivated and contribute minimum effort.

Finally, employers in our study had few connections with educational institutions that might support skill development in their front-line workforce. They did not consider community colleges or other providers as potential sources of new technical workers. They did not consider community colleges or other providers as potential sources of new technical workers. Existing relationships centered on providing job-related skills or certifications to incumbent workers (e.g., certifications for construction inspectors, technical training for traffic signal technicians).

Some employers (and workers) were of the general opinion that American schools do a poor job or have declined since they were in school. Traffic signal technicians and their supervisors generally felt that traffic signal work was too specialized and could only be learned through experience on the job. They wanted employees with a background in electronics or digital systems, but did not expect any amount of school learning to substitute for learning on the job. On the other hand, they wanted technicians to take advantage of employee assistance programs to go back to school to gain more technical skills; while managers had no funds to conduct their own training, employees could be reimbursed for taking job-related courses. Course taking was encouraged in the absence of a firm-based training strategy. Other employers (HA and TA) had some partnership relationships with high schools, but these were not seen as sources for potential workers in the departments or jobs we studied.

Implications for Research and Practice in Occupationally-Oriented Education

Our studies of technical work have several implications for school reform proposals aimed to improve youth preparation for and transition to work. In addition, the findings point to areas of research and development that can inform program development and public policy.

Instructional Activities to Teach Generic Skills Must be Sensitive to Work Context

The concept of generic skills, as defined in this report, is salient to the workers, supervisors, and managers who took part in this study. Skills like communications, problem solving, and working as part of a team are readily observed across different jobs and, according to study participants, are essential to effective performance.

However, while generic skills are identifiable in all jobs, their specific characteristics and importance vary between jobs. The characteristics of problem solving, team work, and communication requirements are related to job demands, which in turn depend on the purpose of the work, the tasks that comprise the job, the organization of the work, and other aspects of the work context.

While employers and educators may have a common desire to improve "communication" skills, the audience, purposes, style, and mode of communication vary widely and are often quite specialized. Inspectors must negotiate with contractors; traffic signal technicians must testify in court and calm irate motorists. The ability to work in teams is similarly valued, but all teams do not work alike, and some teams created by workers are invisible to managers. Some teams have role and knowledge interdependencies that are formalized by job description (survey crew) or

37

regulation (home health care), while others were created by the workers themselves (construction inspectors and test technicians).

In sum, while generic skills are important for students to learn, they must be defined and taught in ways that are contextually authentic. The challenge for education reformers is twofold. First, commonly used, broad, ambiguous terms like "communication" or "problem solving" are inadequate for the purposes of defining instructional content or learning goals. What specific problem solving or communication skills should students demonstrate?

Because broad terms to not reflect variation in work context, they do not help teachers design learning experiences for students that support skill acquisition and development. How should classroom or work-based experiences be designed to foster problem solving or team work?

Learning Environments Should Reflect "Authentic" Practice

The technicians in our study learn and apply generic skills as they are called for in work practice. Similarly, students in occupationally-oriented programs can learn generic skills in properly designed learning environments that simulate work. Models for designing authentic learning environments that reflect the application of particular knowledge and skills include traditional apprenticeship methods and, more recently, cognitive apprenticeship. Cognitive apprenticeship applies some of the situated, guided characteristics of traditional apprenticeship to the teaching of thinking and problem solving (Collins, Brown, and Newman, 1989; Brown, Collins, and Duguid, 1989; Collins, in press).

Research on teaching generic skills in academic and vocational high school classes demonstrates the utility of the cognitive apprenticeship model and provides guidance for classroom design. In a study comparing teachers who were more and less successful in teaching generic skills, successful teachers' practices were similar in several fundamental respects. Teachers had a mix of instructional goals that included both generic and domain-specific skills and knowledge. They pursued their instructional goals by situating learning in authentic practice—they designed classrooms so that students learned skills and knowledge by performing tasks that reflected the complexities of real work performance by adults, and often required students to collaborate on long-term projects. Teachers attempted to mimic a community of practice: an interior design class, for example, ran much like an interior design firm, and an industrial arts class recreated the culture of the manufacturing shop floor. Teachers adopted a variety of non-didactic teaching techniques, such as coaching, one-on-one tutoring, and modeling. They placed much of the responsibility for learning in students' hands, requiring them to make many decisions about the direction and conduct of their projects (Stasz et al., 1990; Stasz et al., 1993).

Since little empirical research on work-based learning exists, future research is needed to help elaborate useful instructional models (OTA, 1995). One promising line of work is the design of learning environments based on constructivist views of learning and understanding (Collins, in press; Collins, Greeno, and Resnick, 1994; Collins, 1994).

Teacher Training and Staff Development Should Support the Design of Authentic Learning Environments

At the present time, broad teaching of generic skills is hampered by the lack of instructional materials that put them in context and by inadequate teacher training. In order to design authentic learning environments that reflect real-world working contexts, teachers must be guided by an instructional design model and a deeper knowledge of work practice.

Most training of preservice and inservice teachers, and subsequently their teaching, still supports a didactic pedagogy and instructional design theory. Teachers and students still spend

much time with lectures, formal recitations, worksheets, or some combination thereof (Cohen, McLaughlin, and Talbert, 1993). Instructional design theory, derived from behaviorist and programmed instruction traditions, seeks to transmit content and skills in a clear, well-structured, and efficient manner (Collins, in press). In contrast, the kinds of curriculum and pedagogical changes discussed in many school reform proposals call for a constructivist approach.

Most preservice teacher training follows a baccalaureate model, which emphasizes subject matter preparation with the addition of courses in teaching methods. Once graduated and working, teachers participate in various staff-development activities, but these typically amount to only a few days per year and are often brief, superficial, and unconnected (Cohen et al., 1993). Even where professional organizations or state curriculum guidelines embrace constructivism and provide staff development (e.g., National Council of Teachers of Mathematics, California curriculum framework), few teachers appear to adopt new instructional practices (Burstein et al., 1995).

Reforms targeted at occupationally-oriented education present yet another staff development challenge—making the connection between school and work. Currently missing in traditional forms of teacher training and staff development is the opportunity for teachers to come in contact with "expert practitioners" in business and industry or in college departments who are engaged in relevant communities of practice. While teacher education employs "teaching experts" to enhance professional development, they do not provide links to communities of practice outside the school. New models of teacher preparation and staff development are needed to expand teachers' views of and contacts with the world of work (Stasz et al., 1993). These might involve summer internships for teachers, collaboration with industry mentors, or other experiences that deepen their knowledge of an occupational area and thus enhance teachers' ability to design authentic learning activities.

Building Effective Industry-Education Partnerships

Many reforms encourage closer cooperation and collaboration between education providers and employers through education-industry partnerships. Such partnerships are expected to help education providers define the knowledge and skills that new workplaces demand in order to design appropriate instructional programs. This study suggests first that employers do not uniformly possess accurate or useful knowledge of skill needs; thus the individuals who work with schools should be carefully selected. As discussed above, employers must define skills more specifically than in the past, in a way that is sensitive to differences associated with jobs and work settings.

It is also important to note that employers in this study had weak connections to schools. They had few contacts with community colleges or other providers as potential sources of new technical workers, and few relationships to support worker retraining or skill upgrading. The weak link between employers and education providers in this study is similarly noted by Grubb and his colleagues in their analysis of the sub-baccalaureate labor market (Grubb et al., 1992).

Firms generally had low regard for high school education, and saw no urgent reason to pursue connections with public or private education providers. They encouraged employees to upgrade their skills through coursework, in part as a substitute for formal job training. These findings suggest that reforms relying on partnerships between education and industry to create a more effective U.S. education and training system may be overly ambitious. At the very least, reformers must recognize that building such partnerships may not be easy. For school-to-work reforms to become widespread it will be important to understand what incentives might encourage enough employers to pursue and maintain such partnerships (cf. Bailey, 1995).

One theme that arises repeatedly in our research and in other commentary on occupationally-oriented education reform is the tension between different conceptions of skills and skill requirements. Public policy and discourse about skills remain rooted in a conception of skill requirements that downplays or ignores work context. As we mentioned earlier, policy makers and reformers rely heavily on employer surveys, interviews, tests, or other data on skills that is not always sensitive to different work contexts. Even the SCANS studies, widely cited and used in occupationally-oriented education reform, fell short of validating their foundation skills and workplace competencies through empirical studies of skills in context. They do, however, caution employers to "conduct their own in-house research to verify the applicability of SCANS competencies and foundations to their jobs" (SCANS, 1992b, pp. 1-11).

Reformers might look to a small but growing body of research that explores skills and skill requirements from a sociocultural perspective, particularly in the kinds of high-performance work environments that are expected to promote productivity and economic health. Recent anthropological studies of work provide deeper inquiries about how people actually work and how workplaces shape work and learning, but many more are needed. Our study and others also suggest that particular attention be paid to the role and function of communities of practice in organizations and how they contribute to learning, standard setting, efficiency, and so on.

At the same time, tools for measuring and assessing skills in context need to be developed. While long-term ethnographic studies are essential to build our knowledge base, they are an impractical alternative to job analysis methods. Some recent research and development efforts are exploring alternatives to traditional task and job analysis methods by examining, for example, the implications of cognitive psychology for analyzing tasks and measuring job performance (e.g., Black, 1994; Black et al., 1995; Glaser, Lesgold, and Gott, 1991). In addition, there is need for validity studies of new skill taxonomies such as developed by SCANS or the federally-funded skill standards projects that link skill standards to productivity standards. These or other research efforts should at least provide guidance for determining the differential requirements for skills across jobs, even if they cannot predict how skills (or lack of them) affect performance.

Occupationally-Oriented Education is One Component of A Workforce Development System

While public education seems under constant criticism for failing to adequately prepare youth for the labor market and thereby undermining the country's ability to compete in the global economy, much less attention is paid to conditions of work and employment that also undermine competitiveness. In just the small sample of firms and jobs that we examined, several other factors besides worker skills clearly affected job performance. Since workers' skills alone cannot account for any firm's shortcomings in performance, then, by extension, educational reform alone will not solve America's economic problems (Barley, 1995). One important line of research is to identify problems that prevent more organizations from adopting high performance regimes and the role of public policy to encourage organizational changes. Appelbaum and Batt (1993), for example, discuss several policy interventions, including job training for front-line workers (not just disadvantaged workers) and incentives for encouraging unions and management to adopt more participative work systems.

Other research could explore strategies for learning and skill development that support changing work environments. Stern (1994), for example, discusses solutions to meeting high performance goals through the strategy of just-in-time learning—i.e., "acquiring skill or knowledge at the time and place where it is needed, instead of learning it ahead of time and in a different place" (p. 2). He outlines several emerging practices in the U.S. and in other industrialized

countries that promote employee development through just-in-time learning, including cross-training by co-workers, job rotation, skill-based pay, suggestion systems, and written analysis of work problems. Stern's approach to developing a taxonomy of practices is appealing for several reasons: (1) it offers specific, concrete suggestions for supporting skill development; (2) it offers flexibility—approaches can be implemented naturally through communities of practice and/or through more formal organizational policy (e.g., skill-based pay, written analysis of work problems); and (3) it offers a consistent way to think about learning practices in work and in other settings, like schools.

All these lines of research will benefit from adopting a sociocultural conception of skills that is attentive to the contexts of job, community of practice, and workplace. Findings and conclusions based on such a contextual conception of skill will be cast in terms that are appropriate for informing effective policies to promote the skills that are required for success in the new workplace.

References

Anderson, J. (1983). *The Architecture of Cognition*. Cambridge, MA: Harvard University Press.

Appelbaum, E. and R. Batt (1993). *High-Performance Work Systems: American Models of Workplace Transformation*. Washington, DC: Economic Policy Institute.

Attewell, P. (1990). What is Skill?, *Work and Occupations* 17(4):422-448.

Bailey, T. (Ed.) (1995). *Learning to Work: Employer Involvement in School-to-Work Transition Programs*. Washington, DC: The Brookings Institution.

Bailey, T. (1993). Can Youth Apprenticeship Thrive in the United States? *Educational Researcher* 22(3):4-10.

Bailey, T. and D. Merritt (1995). *Making Sense of Industry-Based Skills Standards*. Draft paper, Teachers College, Columbia University.

Barley, S. (1995). *The New Crafts: The Rise of the Technical Labor Force and its Implication for the Organization of Work*. Philadelphia, PA: University of Pennsylvania, National Center on the Educational Quality of the Workforce.

Barley, S. and B. Bechky (1994). In the Backrooms of Science: The Work of Technicians in Science Labs, *Work and Occupations* 21(1):85-126.

Berryman, S. and T. Bailey (1992). *The Double Helix of Education and the Economy, Executive Summary*. New York: Teachers College, Columbia University, Institute on Education and the Economy.

Bikson, T. K. and S. A. Law (1994). *Global Preparedness and Human Resources: College and Corporate Perspectives*, MR-326-CPC. Santa Monica, CA: RAND.

Billett, S. (1993). Authenticity and a Culture of Practice Within Modes of Skill Development, *Australian and New Zealand Journal of Vocational Education Research* 2(1):1-29.

Black, J. (1994). *Cognitive Task Analysis*, Unpublished manuscript, Teachers College, Columbia University.

Black, J., E. Dimaraki, D. VanEsselstyn, and R. Flanagan (1995). *Using a Knowledge Representations Approach to Cognitive Task Analysis*. Unpublished manuscript, Teachers College, Columbia University.

Brown, J., A. Collins, and P. Duguid (1989). Situated Cognition and the Culture of Learning, *Educational Researcher* January-February:32-42.

41

Burstein, L., L. McDonnell, J. Van Winkle, T. Ormseth, J. Mirocha, and G. Guiton (1995). *Validating National Curriculum Indicators*, MR-658-NSF. Santa Monica, CA: RAND.

Cappelli, P. (1992). *Is the "Skills Gap" Really About Attitudes?* EQW Working Paper. Philadelphia, PA: National Center on the Educational Quality of the Workforce.

Cohen, D., M. McLaughlin, and J. Talbert (Eds.) (1993). *Teaching for Understanding: Challenges for Policy and Practice*. San Francisco, CA: Jossey-Bass.

Collins, A. (1994). Goal-Based Scenarios and the Problem of Situated Learning: A Commentary on Andersen Consulting's Design of Goal-Based Scenarios, *Educational Technology*, November-December:30-32.

Collins, A., J. Brown, and S. Newman (1989). "Cognitive Apprenticeship: Teaching the Craft of Reading, Writing, and Mathematics," in L. Resnick (Ed.), *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Collins, A., J. Greeno, and L. Resnick (1994). "Learning Environments," in J. Husen and T. Postlewaite (Eds.), *International Encyclopedia of Education (2nd ed.)*. Oxford, UK: Pergamon.

Darrah, C. (1992). Workplace Skills in Context, *Human Organization* 51(3):264-273.

Darrah, C. (1994). Skill Requirements at Work: Rhetoric Versus Reality, *Work and Occupations* 21(1):64-84.

Glaser, R., A. Lesgold, and S. Gott (1991). "Implications of Cognitive Psychology for Measuring Job Performance," in A. K. Wigdor and B. F Green (Eds.), *Performance Assessment for the Workplace*, Vol. II 1-26. Washington, DC: National Academy Press.

Grubb, W. N., T. Dickinson, L. Giordano, and G. Kaplan (1992). *Betwixt and Between: Education, Skills, and Employment in Sub-Baccalaureate Labor Markets*. Berkeley, CA: National Center for Research in Vocational Education.

Hackman, J. R. and G. Oldham (1980). *Work Redesign*. Reading, MA: Addison-Wesley Publishing.

Hanser, L. M. (1995). *Traditional and Cognitive Job Analyses as Tools for Understanding the Skills Gap*, DRU-846-1-NCRVE/UCB. Santa Monica, CA: RAND.

Hart-Landsberg, S., J. Braunger, S. Reder, and M. Cross (1992). *Learning the Ropes: The Social Construction of Work-Based Learning*,MDS-413. Berkeley, CA: National Center for Research in Vocational Education.

Hudis, P., D. Bradby, C. Brown, E. G. Hoachlander, K. Levesque, and S. Nachuck (1992). *Meeting the Personnel Needs of the Health Care Industry Through Vocational Education Programs*. Berkeley, CA: National Center for Research in Vocational Education.

Hull, G. (1993). Hearing Other Voices: A Critical Assessment of Popular Views on Literacy and Work, *Harvard Educational Review*, 63(1):20-49.

Hutchins, E. (1991). "The Social Organization of Distributed Cognition," in L. Resnick, J. Levine, and S. Teasley (Eds.), *Perspectives on Socially Shared Cognition*, pp. 283-307. Washington, DC: American Psychological Association.

Kazis, R. (1993). *Improving the Transition from School to Work in the United States*. Washington, DC: American Youth Policy Forum.

Lave, J. and E. Wenger (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge, MA: Cambridge University Press.

Lave, J. (1988). *Cognition in Practice: Mind, Mathematics, and Culture in Everyday Life*. Cambridge, MA: Cambridge University Press.

42

Lave, J. (1991). "Situating Learning in Communities of Practice," in L. Resnick, J. Levine, and S. Teasley (Eds.), *Perspectives on Socially Shared Cognition*, pp. 63-82. Washington, DC: American Psychological Association.

Levine, J. and R. Moreland (1991). "Culture and Socialization in Work Groups," in L. Resnick, J. Levine, and S. Teasley (Eds.), *Perspectives on Socially Shared Cognition*, pp. 257-279. Washington, DC: American Psychological Association.

Lillard, L. and H. Tan (1986). *Private Sector Training: Who Gets it and What are its Effects?* R-3331-DOL/RC. Santa Monica, CA: RAND.

Marshall, R. and M. Tucker (1992). *Thinking for a Living: Education and the Wealth of Nations.* New York: Basic Books.

National Center on Educational Quality of the Workforce (1995). *EQW National Employer Survey* (EQW-NES). Philadelphia, PA: University of Pennsylvania.

Natriello, G. (1989). *What do Employers Want in Entry-Level Workers? An Assessment of the Evidence*, NCEE Occasional Paper No. 7. New York: Teachers College, Columbia University.

Newell, A. and H. Simon (1972). *Human Problem Solving.* Englewood Cliffs, NJ: Prentice-Hall.

Orr, J. (1991). *Talking About Machines: An Ethnography of a Modern Job.* PARC Technical Report SSL-91-07 (P9100132), Palo Alto, CA: Xerox PARC.

Perkins, D. and G. Salomon (1989). Are Cognitive Skills Context-Bound?, *Educational Researcher* January-February:16-25.

Raizen, S. (1989). *Reforming Education for Work: A Cognitive Science Perspective.* Berkeley, CA: University of California, Berkeley, National Center for Research in Vocational Education.

Resnick, L. (1991). "Shared Cognition: Thinking As Social Practice," in L. Resnick, J. Levine, and S. Teasley (Eds.), *Perspectives on Socially Shared Cognition*, pp. 1-20. Washington, DC: American Psychological Association.

Rogers, J. and W. Streeck (1991). *Skill Needs and Training Strategies in the Wisconsin Metalworking Industry.* Madison, WI: University of Wisconsin-Madison.

Scribner, S. and P. Sachs (1990). *A Study of On-the-Job Training*, Technical Paper No. 13. New York: Institute on Education and the Economy, Teachers College, Columbia University.

Scribner, S. (1988). *Head and Hand: An Action Approach to Thinking*, Occasional Paper No. 3. New York: National Center on Education and Employment.

Scribner, S., P. Sachs, L. DiBello, and J. Kindred (1993). *Knowledge Acquisition at Work.* New York: IEE Publications.

Secretary's Commission on Achieving Necessary Skills (SCANS) (1991). *What Work Requires of Schools.* Washington, DC: U.S. Department of Labor.

Secretary's Commission on Achieving Necessary Skills (SCANS) (1992a). *Learning a Living: A Blueprint for High Performance.* Washington, DC: U.S. Department of Labor.

Secretary's Commission on Achieving Necessary Skills (SCANS) (1992b). *Skills and Tasks for Jobs.* Washington, DC: U.S. Department of Labor.

Spenner, K. (1990). Skill: Meanings, Methods, and Measures, *Work and Occupations* 17(4):399-421.

Stasz, C., D. McArthur, M. Lewis, and K. Ramsey (1990). *Teaching and Learning Generic Skills for the Workplace*, R-4004-NCRVE/UCB. Santa Monica, CA: RAND.

Stasz, C., K. Ramsey, R. Eden, E. Melamid, and T. Kaganoff (1996). *Workplace Skills in Practice*, MR-722-NCRVE/UCB. Santa Monica, CA: RAND.

Stasz, C., K. Ramsey, R. Eden, J. DaVanzo, H. Farris, and M. Lewis (1993). *Classrooms that Work: Teaching Generic Skills in Academic and Vocational Settings*, MR-169-NCRVE/UCB. Santa Monica, CA: RAND.

Stern, D. (1994). *Human Resource Development in a Learning-Based Economy*, paper prepared for OECD conference "Employment and Growth in the Knowledge-Based Economy," Copenhagen, November 7-8, 1994.

U.S. Congress, Office of Technology Assessment (OTA) (1995). *Learning to Work: Making the Transition from School to Work*. OTA-EHR-637. Washington, DC: U.S. Government Printing Office.

Vaughn, R. and S. Berryman (1989). *Employer-Sponsored Training: Current Status, Future Possibilities*. New York: Teachers College, Columbia University.

Vygotsky, L. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Yin, R. K. (1994). *Case Study Research: Design and Methods*, Second Edition. Thousand Oaks, CA: Sage Publications.

44

The Impact Of A Community Based School To Work Program For High Risk Youth

Laurel Adler
Peter Searls
Larry Weigel
San Gabriel Valley Regional Occupational Program

Rita Hemsley
James Dick
University Of California—Riverside

ABSTRACT

The East San Gabriel Valley School-to-Work Program was designed to target at-risk youth. Key characteristics of the model project include: (1) Partnerships with over 300 businesses designed to put career preparation education into a real-life context for students; (2) Partnerships with over 40 community service agencies that provide the support services necessary to keep high risk youth in school, and; (3) Practical application of both academic and vocational skills provided to students through worksite instruction and contextual classroom instruction.

The research design utilized is a match-paired comparison/treatment group which followed program graduates over a 7-year period. the treatment group, are found to have: (1) a significantly larger proportion of graduates from high school than those in the control group; (2) higher rates of college attendance; (3) higher percentage of employment; (4) almost twice the number of students in upwardly mobile jobs; and (5) significantly higher grades in both academic and technical subjects. A recently completed replication of the study in a neighboring school system has yielded comparable results.

Products of the research study include reports on the effectiveness of this school-to-work transition program, as well as the effectiveness of specific components of the program such as mentoring and business based classroom *instruction*.

BACKGROUND: Education and the Economy

The income and educational disparity between the rich and the poor in American society has been steadily widening for more than two decades. In previous generations, high school drop outs and even those with less than an eighth grade education could obtain lifetime employment. Today, however, the manufacturing jobs which brought a middle class existence to so many yet required a narrow band of academic and vocational skills, are disappearing, going the way of nineteenth-century farm labor. The fundamental fault line, according to numerous researchers, between the rich and the poor is primarily based on education and skills. In addition to the growing income disparities, the demographics of the United States, and California in particular are changing rapidly. Los Angeles County is already the most ethnically diverse community in the world, with ethnic minorities making up the majority of the inhabitants. Throughout California, 80% of this

45

decade's labor force growth is among its various minority populations (California Department of Finance). Clearly the future economic success of California and the rest of the country lies in providing an educational system where all students, regardless of income or ethnicity can achieve. Unfortunately, the largest high school drop out rates are among Hispanics and African American students (California Department of Education). For example, despite composing the majority of enrollments in Los Angeles County K-12 school systems, Hispanic students are a distinct minority at the county's colleges and universities. The problem starts early in these students' careers. According to the NAEP, by third grade minority students are already beginning to fall behind in achievement. By junior high school, minority children have fallen a year or more behind in standardized achievement tests and the gap widens in high school. Bill Aldridge, director of the Science Teachers Association, describes this process using a powerful metaphor:

> Imagine a flask full of gas molecules all moving at different speeds. If the fastest molecules are selected, then other molecules are ignored that will later change speeds. Likewise, young people who happen, at a certain time, to be moving fastest are selected, and other young people who happen at the moment to be moving slower are disregarded. These selected students are given an added push in the form of resources, teacher attention and recognition while the rest are neglected.

Despite the uneven education which has been provided to this diverse student population, these youth will soon be entering an American workforce which has been split into two disparate parts (Department of Labor, 1992). A small minority, empowered by education, is highly skilled and highly paid. Others have been isolated and relegated to low pay for work requiring minimal skills. According to Peter Drucker (Nov. 1994), in the new economic order that our current youth will soon be entering, knowledge, not labor or raw material or capital is the key resource. Drucker notes that these "knowledge workers" require a good deal of formal education and the ability to acquire and to apply theoretical and analytical knowledge. Knowledge workers must have a different approach to work and a different mind-set. Above all, knowledge workers must develop a habit of continuous learning.

Changing the mind-set of the American public from an industrial-based economy in which low-skilled workers could earn high pay, to an economy in which the acquisition of knowledge is the key, is the social challenge of the knowledge society. However, as Marshall and Tucker note in Thinking for a Living (1992), for most of this century, American enterprise has been organized on the principle that most of us do not need to know much to do the work that has to be done. The United States economy has been structured to operate largely on the premise that, for the country to be successful, only a few need to know or be able to do very much.

However, students now need to develop both broader and deeper skills in order to meet new competitive standards and to complement flexible organizational structures and technology (Carnevale, 1993). American workers need competencies that go far beyond the traditionally recognized "Big Three" of reading, writing, and arithmetic (Foucar-Szocki, 1992). On-the-job diverse tasks have been combined in new ways and even entry-level workers have been given new responsibilities. Employees today need to know how to communicate effectively and how to think creatively and independently. They need to be problem-solvers. They must be adept at negotiating and at working as part of a team. They must know how to lead, how to motivate, how to improve continually. Fortune Magazine (June, 1994) describes the new kind of employee as one who is empathetic, flexible, inventive, and able to work with minimal levels of supervision. The competitive workplace of today, regardless of the product or service, is a high skill environment designed around technology and people who work as part of a much larger whole.

46

Marshall and Tucker observe that although the economy is changing dramatically, the form and function of the American education system has remained roughly the same. This system, while continuing to serve the needs of the university bound student in a somewhat acceptable manner, has virtually ignored the more than 50% of students who do not pursue a traditional four year college education, even though these students face the most daunting obstacles in attempting to find well paying jobs.

Stern (1992) notes that since the 1917 Smith-Hughes Act, vocational education has been defined as preparation for occupations not ordinarily requiring a bachelor's degree or advanced degree. Accordingly, students aspiring to the more highly paid and prestigious jobs for which college degrees are required have avoided vocational education. The unintended result has been to institutionalize a superficial dichotomy between academics and vocational education. This dichotomy is currently locking individuals out of the economic mainstream, either precluding their entry into or making them marginal to the labor market.

Academic and Vocational Integration

The integration of vocational and academic learning is intended to eliminate the dichotomy that exists between vocational and academic education. The core of this concept is to organize the best curricular and pedagogical practices of academic and vocational education into a single, "integrated" experience. The goal of an integrated curriculum is to ensure that each student learns both theory and application in specific career preparation, learns transferable academic and vocational skills that are needed in the workplace, and demonstrates competence in those skills that assure successful transition from high school to postsecondary education. According to the Rand Corporation (1993), the approach is designed to rectify the following perceived problems: (1) Poor basic and generic work-related skills; (2) Inability to apply knowledge drawn from theory to solve workplace problems; (3) Lack of engagement on the part of students who have dropped out of school; (4) Poor school transition in which students graduate from high school unprepared for the transition to college or the work world; and, (5) Negative effects of tracking.

Gardner (1991), notes that ultimately, any form of learning requires performance. For this performance to have meaning, it must be offered in context, what Gardner calls contextual learning. Gardner advocates a learning structure built along the same lines as an apprenticeship, what Berryman calls cognitive apprenticeships. The focus of cognitive apprenticeship is on learning through guided experience, emphasizing cognitive skills and processes, in addition to the physical ones that characterize traditional apprenticeship. Thurow (1992), cautions that work-based apprenticeships alone tend to produce workers with very narrow skills who cannot absorb new technologies. Berryman (1992) asserts however, that a mixed strategy of school based cognitive apprenticeships and work-based apprenticeships (paid or unpaid) may offer the optimal opportunity to integrate vocational and academic education. The curriculum and instructional strategies of the East San Gabriel Valley Regional Occupational Program combine work-based and cognitive apprenticeships and school-based academic instruction utilizing partnerships between schools and businesses. The program model focuses on instruction that is project oriented and is integrated into academic/vocational clusters rather than being divided into isolated courses. Business/education partnerships provide an avenue where project oriented learning can optimally occur within integrated academic/vocational clusters.

Model Project: Target Community

Target students of this demonstration project are students from participating high schools in Eastern Los Angeles County. The Regional Occupational Program is the coordinating agency

47

of the East San Gabriel Valley Partnership, a partnership of 13 school districts, four Regional Occupational Programs, three community colleges, six four year colleges and over 500 hundred businesses and community agencies. The specific area of the partnership targeted for this study has been identified by Rebuild LA (RLA), the community group formed to help Los Angeles recover from the riots, as "a neglected area". Los Angeles has been described as "an international metaphor for the urban challenge" (Tuttle, 1994). The target community of this study is a microcosm of the larger Los Angeles community and is predominantly made up of ethnic minorities with Hispanics being the largest ethnic group at over 65% of the population. United Way of Los Angeles conducted a survey of the primary target area and found that it has the highest growth rate and population density as well as the largest household size and youngest population in Eastern Los Angeles County. The unemployment rate in the area is among the highest in the eastern county and has the lowest per capita income and the highest percent of people living in poverty. Nearly one-fourth of all children aged 0-17 live in poverty. The dropout rate at some area high schools is as high as 55%. Clearly business as usual does not suffice for this population. There is an acute need for reform that addresses student academic and vocational training needs while providing necessary support services.

The model program has focused on these major goals:

1. To provide students the skills and attitudes needed for successful competitive entry into the workforce.
2. To articulate the program curriculum with college and university instruction; therefore, providing students the motivation as well as the opportunity to pursue higher education.
3. To utilize business and industry for major portions of student instruction.
4. To provide a comprehensive curriculum, reviewed regularly by business and industry, that emphasizes the integration and acquisition of both academic and career related skills.
5. To provide students the instructional and support services beyond those traditionally offered in a high school setting, which are needed to help them graduate from high school.
6. To produce students with marketable job skills, including entrepreneurial and networking skills, as well as a clear understanding of the work ethic.
7. To produce competent, aggressive leaders capable of advanced career positions.

The model operates under the philosophy that true educational reform must be locally initiated and that rigid activities that might work in one setting may not be appropriate in another. Therefore the model emphasizes the development of the process for producing an integrated program that taps into local resources along with actual curricula that can be replicated in diverse settings. A major goal of the project is to demonstrate that the specific strategies that the model utilizes has a significant positive effect on high-risk youth in terms of high school graduation, academic achievement, progress to postsecondary education and employment. The model program achieves these goals by utilizing several key components. They are:
1. Clustered instruction that combines subject matter such as math/ physics/computer assisted drafting into a unified program area and which provides instruction within the context of specific career pathways.
2. Adaptive curriculum that emphasizes academic instruction and experiential learning.

48

3. A combination of instructional approaches including classroom instruction, worksite apprenticeships, community learning, student internships, cooperative learning groups, peer tutoring, community mentors, job shadowing and individualized computer instruction. Students access information and create projects with various technologies.

4. Cooperative educational programs with business and industry that enable students to receive a portion of their instruction in the community. Industry-based worksite apprenticeships (paid and unpaid) allow the student to experience, early on, the application of academic skills to careers. Worksite apprenticeships also afford students access to technology routinely used in the workplace. Learning technology is viewed by business partners as a community investment.

5. Articulation of Curriculum developed by the project with appropriate courses at local community colleges and universities. Prior to the completion of the twelfth grade, project students are permitted to take the academic assessment tests required by the participating colleges. If passed at the required level, the college will waive the assessment requirement when the student enters the college.

6. Cooperative liaisons with local business and industry, colleges, universities, and high schools that link the high school student simultaneously with business, community and post-secondary institutions. This allows accessibility to both real world experiences and for continuation into post-secondary education for students who previously may not have realized their potential.

7. Early identification and accessible ongoing monitoring and support services which monitor student progress, identify potential problems, and provide services to assist students overcome barriers to school completion. Business volunteers, college and high school students, and senior volunteers acting as tutors, mentors, job coaches and peer advisors serve as role models that provide confidence and assurance to participants. Other vital support services include child care for teen mothers and transportation to worksite learning.

8. Parental involvement which includes the parent in the assessment, goal setting, monitoring, support and follow-up process.

9. Cooperative liaison with local community service agencies which provide a wide variety of support services necessary to meet the diverse needs of students and their families possess.

10. Guidance and counseling that includes the use of general and career counselors and technicians as well as teachers, mentors, and support staff to assess and counsel students for career decision-making and career pathway preparation. The overall counseling and guidance services are linked to "early identification and accessible support services" to meet the additional needs of at-risk students experiencing academic, vocational, and/or personal barriers to success.

Training Process

Student Enrollment. The project itself operates on an open-entry, open-exit basis. Individual student goals are set and may include: (1) intense remediation in basic subject areas; (2)

49

pre-vocational and vocational training; (3) assignment to a mentor and/or tutor; (4) counseling and guidance including home-based guidance; (5) assignment to a cluster group (school-within-a-school) and cooperative learning groups; (6) worksite learning; and (7) summer employment opportunities.

Assessment. Prior to and during enrollment, students are assessed including an in-depth academic and vocational assessment. The results of the student's assessment are be included in the Personal Academic and Career Plan (PACP) developed by the student, school staff and parents.

Individualized Learning Plan. An Individualized Plan is developed for each student. Included in this plan are the specific academic skills, and job related competencies each student needs to achieve for proficiency in his or her career choice. Specific support and follow-up services needed to provide for transition into employment are identified and provided.

Referral and Placement into Appropriate Learning Program(s) Using Partners. Program placement is based on assessment results and student goals. Business volunteers and college students, provide individualized, competency-based tutorial instruction. Tutors also work with small groups in cooperative learning teams. Occupational skills training occurs both in the classroom and at business partners, worksites. Worksite and classroom instruction is coordinated and sequenced in a manner which assures each complements the other. Business and industry partners participate in subject matter advisory meetings to assure this instruction is coordinated and relevant to current market standards. Various instructional strategies are implemented to enhance career awareness, employability skills and/or basic academic skills, and include individualized instruction, direct group instruction, and cooperative learning groups.

Support Services. Specific support services are provided to students by a wide variety of community and business partners and are initially identified at the time the student enrolls. At-risk students have a range of special needs that often go unfulfilled. As a result, many often move through the system, fall further behind and dropout. The schools and colleges involved in this pilot project have formed partnerships with community based organizations, social service agencies, State of California service providers and businesses to help meet these special needs. Community linkages which provide necessary social support assistance for students and their families include Los Angeles County Mental Health, Los Angeles County Department of Health Services, the California Employment Development Department, the California State Department of Rehabilitation, city parks and recreation and community service organizations make up a part of this social services network. Child care is provided as needed as is transportation. Parenting skills are taught to teen parents.

Tech-Prep Articulation Agreements. 2+2 and 2+2+2 Tech-Prep articulation agreements are a vital aspect of the model project. These articulation agreements allow the student to apply course work completed at the secondary level to program requirements at the community college. In the case of a 2+2+2 tech-prep articulation agreement, community college course work can be applied at the university level. Currently over two dozen such agreements exist.

Business Partnerships. There are currently over 300 partnership agreements between business and the Program. Project instructors develop new partnerships on an on-going basis. Business and industry provide worksite instruction, mentoring, job shadowing, and job placement opportunities for students. In addition, they provide up-to-date labor market information and assist in the development and modification of curriculum. The business component of the partnership includes on-the-job training and placement for students. Job placement is a key aspect of this model program for students nearing program completion. Viable employment options which provide for movement up the career ladder are an integral aspect of the project.

In addition to its affiliations with business and industry already mentioned, the project has as its partners a wide variety of state, Federal, and local resources which allow it to offer a large number of supportive services to participants at al stages of their training. These resources include:

50

National Council on Aging which provides tutors and mentors for high risk students; JTPA, which provides job development and job placement; Department of Rehabilitation which provides needed support services for students; the California Employment Development Department which allows access to daily up-to-date job placement information and services; and, local Chamber of Commerce's which provide job shadowing and role modeling by having business and industry leaders volunteer to be guest speakers and mentors. By utilizing a wide variety of community and other resources, the model is a cost-effective one that offers the prospect of be replicated in whole or in part.

Overcoming Barriers. The geographic area served by the East San Gabriel Valley Partnership is characteristic of the diversity that exists throughout Los Angeles. The ethnic make-up of the area is primarily minority. Many participating students bring with them multiple barriers to successfully completing the program. These barriers include: a) Having dropped out of school; b) Economically disadvantaged backgrounds; c) Being two or more grade levels behind on tests of academic achievement which include deficiencies in the basic skills areas of reading, writing, and mathematics; d) Being overage for their particular grade level because of earlier grade retention; e) Being behind in number of credits needed to graduate; f) Poor attendance; g) Lack of transportation to and from training and support service agencies; h) Teen parenthood which as a result leads to a need for child care and for the acquisition of parenting skills; I) Gang related problems; j) Need for learning activities which challenge the ability levels of academically talented students; k) Disabilities which impede progress in school; l) Limited English proficiency; and, m) High transiency rates. In addition to these individual barriers to participation (as discussed above) there are also some barriers that must be addressed if students are to be prepared for high-skill, high-wage jobs. These overall barriers to student participation include;

Language and Cultural Differences. More than 30 different languages are spoken at schools within the Partnership. Additionally, a high rate of transience exists in which some classrooms the turnover rate is more than 100%. Perceptions of education differ among different cultural groups especially those that are relatively new to the area, either unable or unaware of how to communicate with the schools. One of the major project objectives is to train both bilingual students and community volunteers as tutors and mentors. Not only can these business mentors communicate in the student's predominant language, but can also serve as role models for students who may not have had an opportunity to relate to an adult role model.

To help individual students in the program overcome one or more of these barriers and to assure they have equal access to the full range of program components the Partners provide the following:

1. Dropout Recovery Programs piloted in several partner schools which actively recruit high school dropouts and returns them to school through an individualized education program based on their academic and support service needs.
2. Enrollment in Vocational Training on an Open-Entry/Open-Exit Basis provides for immediate reentry of returning high school dropouts to school..
3. Academic and Vocational Instruction operated in a decentralized, multi-site format which helps neutralized some gang "turf" problems and reduce fears of going to a large, impersonal school site.
4. Transportation for Teen Mothers Transportation is provided that picks the teen mothers and their children up at home, takes them to the child care center where the mother leaves her child, transports the mother to her training site, picks the mother and child up and brings them back home.

51

5.   Child Care for children of program students and Parenting Skills Classes for teen mothers and fathers.
6.   The Tutor/Mentor Program that provides students individual attention and helps students learn coping skills necessary for effectively dealing with various social and individual problems.
7.   Parent Participation Parent outreach programs bring parents into the educational process not just when their child may be experiencing difficulty, but regularly throughout the time their children participate in this program. A variety of community agencies are involved to help provide needed support services for families.

Program Evaluation. The evaluation component is a strong part of the total design of the project. The University of California, Riverside educational research wing the California Education Research cooperative (CERC) performs the role of Director of Evaluation of all project objectives and supervises a multi-year student follow-up. The results of this research are described in the next section.

Results

This section is in three parts, the first section is a description of results of the original students who were in the first subject area to pilot the model components as described above. This first group consisted of students who were in the marketing career pathway. They were from high schools in the partnership which traditionally had high drop out rates, were high poverty communities and who served primarily minority students. The second section describes the results of a study conducted in a neighboring community in Southern California. The students in this study were in a program which utilized the same model components, but with a different career major: health careers. The purpose of this second study was to see if the results of the model project could be replicated in another community and utilizing a different subject area. The third section, describes recently gathered data of additional students who were enrolled in the East San Gabriel Valley model project, but in career majors other than marketing. The data in this third section are not yet complete but are still included because of their potential relevance to the other two studies described.

The East San Gabriel Valley Marketing Program
(Prepared by Dr. Rita Hemsley and Dr. James Dick - University of California, Riverside)

Claim Statements

The claims for this program are that, relative to other general track high school students, participants in the program have a higher probability of:

➢   graduating from high school
➢   continuing into post-secondary education
➢   securing employment
➢   on-the-job upward mobility
➢   improved grade point averages

52

Design

Students in the treatment group were identified as those who had participated in the integrated academic and vocational curriculum. Program participants were given a structured interview after they had been out of high school one to four years. Only those students who completed the follow-up interview (70% of program participants were contacted) and had sophomore GPA data were considered as the treatment group in these analyses.

A matched pair comparison group was sampled from students who attended the same high schools during the same years as the treatment group. Students in the comparison sample were initially identified on the basis of: 1) not having enrolled in classes offered by the Partnership; and 2) began high school during the same years as the treatment group.

The initial comparison group was oversampled which thus allowed for more stringent matched pairing to be pursued. In this effort, the initial comparison group was stratified by sophomore GPA quartiles, ethnicity (Hispanic & non-Hispanic) and gender, thus producing a 4 x 2 x 2 sampling matrix.

Sample

A total of 550 students were included in the final sample. As a consequence of the post hoc matching procedures, each group had 275 students, matched on ethnicity, general and quartile of sophomore GPA. As a result of the stratified random matching procedures, no variation occurred between the two samples on these three variables.

Instruments and Procedures

The instrument used in the structured, telephone interview was one initially developed by the Project and the University of California Riverside for collecting information on program completers and leavers, as well as determining post program job status for state-required annual reports. These follow-up procedures have been utilized by the Partnership for several years, providing for ample field testing and maximizing return-rates.

Data Collection

Student grades at the 10th and 12th grade years for both the treatment and control groups were provided by high school counseling offices. Ethnic classification was reduced to Hispanic or non-Hispanic because of the limited nature of ethnic data on the comparison group.

Follow-up data were gathered via the phone interview described in the instrument section. Additional back-up interviews were also given to employers to evaluate the information.

Data Analysis

Descriptive statistics were generated using SPSS/PC 6.0 statistical software. Because of the care, post hoc sampling the confounds of ethnicity, gender and sophomore GPAs within the two groups were controlled. As such, the claims made with these data are substantiated with relevant contingency tables and the resulting chi-square statistic of differences.

53

1.   Treatment More Likely to Graduate from High School. This claim was generally substantiated by the data. On a year-by-year analysis, the treatment group had noticeably better graduation rates than the control group in all but the last year of the study. There was also much less variance in the graduation rates of the treatment than the control. The graduation rate of the treatment sample ranged from 84 to 93 percent per year over the five years of the study, a total spread of 9 percentage points. The range of the comparison sample's rate of graduation was as much as 25 percentage points with a low of 63 percent and a high of 88 percent. This difference in graduation rates for the two groups was significant at the .01 level.

2.   Treatment More Likely to Pursue Higher Education. On the variable of college attendance, the difference between the treatment and control group was significant at the .01 level. Nearly 80% of the males in the treatment had attended some level of higher training while just over half of the control group had pursued any higher education. More than 70% of the treatment females attended some higher education compared to just over half of the control females. Data is currently being gathered to examine the rate at which these students complete their postsecondary endeavors.

3.   Treatment More Likely to be Employed. On a year-by-year analysis, the treatment group had employment rates consistently above ninety percent while the control group's rate of employment ranged from 57 to 85%, statistically significant at the .01 level. Individuals in the treatment group, both male and female, were far more likely to be full-time employed than their counterparts in the control group.

4.   Treatment More Likely to Get Upwardly Mobile Jobs. When comparing all employed individuals in both the treatment and control groups on the variable of whether or not their job title and description indicated a management level or management track job, the treatment group was far ahead of the control. The rates were similar for males and females. Over 16% of the first year completers of the program were classified as being in a management track, while only about 4% of the control group was clearly in management track jobs, statistically significant at the .05 level. The project is currently surveying subsequent program completers to examine the rate at which they are moving into management tracks.

5.   Treatment More Likely to Have Higher Graduating Grade Point Averages. The grade point averages of the treatment group and the control group were compared to each other at two point in time. The grade point averages of the two groups were calculated at the end of the tenth grade and then compared to the grade point averages for the two groups at the end of the 12th grade. At the end of the 10th grade, the control group had a combined grade point average of 2.16. At the end of the 12th grade the control group had a combined grade point average of 2.16. The grade point average for the treatment group at the end of the sophomore year was 2.09. At the end of the 12th grade, the grade point average for the treatment group was 2.23. There was then, no change in the combined grade point average for the control group. Whereas for the treatment

group, the combined grade point average was raised by .14, a significant difference at the .01 level.

Summary of Supplementary Evidence for Program Success

Quantitative analysis of the outcome data provides strong support for the four claims. Other, more qualitative descriptions can also provide valuable evidence of program success. The anecdotal data that help to explain the relationship of program components to outcomes are provided also have an effect on their higher graduating grade point averages.

Increased student graduation rates and a concomitant reduction of dropouts may be related to the ability of the program to engage students in learning and preparation for a career. Evidence of the level of this engagement is shown through student involvement in clubs and statewide competitions. The higher rates of college attendance may be influenced by affiliations between the program and area colleges and trade/technical schools. The extent of these relationships is evidenced by a listing of those school of higher learning with which the program has partnership affiliations and curriculum articulation agreements.

Placement in upwardly mobile jobs related to training seems to be improved when a training program works closely with business and industry. With over 300 participating area businesses affiliated with the program, support is given to the positive link between the business/school partnership modeled by this program.

Connections with Business and Industry. A characteristic of the program that contributes to the success of students in competing for quality jobs is its strong connection with business and industry. Strong ties with business are visible through the nearly 300 businesses that provide on-site training of students. Further, representatives of business validate course competencies as well as the college and university articulation process. Business representatives serve as guest lecturers in the classroom and as professional role models and mentors. The connection that participating students can see between their academic studies and their worksite learning experiences may also have an effect on their higher graduating grade point averages.

Engagement of Students through Career-Related Activities. One of the outstanding characteristics of the program contributing to the high rates of graduation and higher graduating grade point averages among the participants is the extent to which it engages students in learning through incorporating into the curriculum what is normally seen as professional leadership activities.

Incentives to Pursue Higher Education. A key component of the program that may contribute to the high rates of continued education is the partnerships with institutions of higher education. Through these partnerships, various curriculum articulation agreements have been forged, providing students college credit for courses taken at the high-school level through the Partnership Program. In addition to a jump-start on college, students are given tours of the programs that represent a continuation of their study in their career related training field.

Program Recognition and Awards. If public recognition is evidence of program viability, then this program certainly meets a high standard. The program has received recognition on the national, state, and local levels for its outstanding quality.

Interpretation and Discussion of Results

This study does provide a valuable look at the differences between a general track high school program and one that is supplemented with a focused career training component. The following sections explore the relationships between treatment and effect that warrant further analysis and the possible rival hypotheses.

Relationship Between Effect and Treatment

To explore alternative explanations of treatment effect on graduation, one would have to assess student motives for entry and exit from the program, the extent to which students felt the program influenced their decision to stay and complete high school instead of dropping out, and the extent to which support services contributed to program and high school completion.

The program feature appearing to be linked to increased rates of pursuing higher education was the articulation of program curriculum with institutions of higher education. Program administrators report that as students in the program earn college credit while still in high school, their own level of self-confidence in their ability to succeed in college seems to increase markedly. In addition, as students are exposed to specific career options with greater earning potential in the field, they seem to more frequently choose to continue their education as the best route to self-improvement. To confirm these projected relationships between program components and effects on student pursuit of higher education one would have to follow-up on levels of student self-confidence, improvement of grades and study skills, and students' reasons for continuing their studies.

The extreme differences between the treatment and control groups on full-time employment indicates a powerful treatment effect. Over ninety percent of the treatment group was full-time employed, while only about forty percent of the control group held full-time jobs. The program features that could contribute to higher employment rates for the treatment group include tutoring and mentoring, training in specific job skills, on-the-job training and coaching, training in job readiness and job finding skills, and free placement services.

Other program characteristics that may contribute to high placement and employment rates and higher graduating grade point averages include a relevant and up-to-date curriculum, close connections with business and industry, and instructors who place a high priority on successful full-time placement of their students in training-related jobs. This study confirms the hypothesis that outstanding career preparation training increases the likelihood of earlier job placement.

An important issue to assess is the value of an earlier beginning in employment that quality vocational training affords. The preliminary analysis of job positions conducted as part of this study suggests a treatment effect of more rapid ascension to management-type, or upwardly mobile jobs. Although the measurement of this effect is subject to some question, the size of the difference points to some important possibilities for the next round of study. If the treatment program can speed up both placement and promotion to positions of greater responsibility, then it has promise for solving some of the labor force quality problems that have been the source of much negative press about American education. Clearly, an important feature of the model program that would promote upward mobility on the job is the exposure of students in the program to the career ladder possibilities in their career field. This exposure is facilitated through on-the-job training, job coaching, mentoring, and participation in career-related competitions.

Control of Rival Hypotheses

One plausible hypothesis is that the students in the treatment group were more likely to succeed due to initial differences in motivation and ability. Staff controlled for this possibility by match pairing the students on initial GPA. In addition the results of a survey administered to Partnership students in 1993 (n = 689) as part of the accreditation process asked students to indicate the degree to which counselors told the students of the job possibilities related to Partnership classes before registering. Over 70% of the students indicated they selected the Partnership process without any knowledge of the job potential or other related successes. This is in addition to the fact that the Partnership courses appear in each High School course schedule the

same as other electives. One might conclude that unless the student was counseled otherwise (over 70% indicated they were not), they enrolled in program courses with no less motivation to get a job than students enrolling in other nonprogram courses. Clearly, initial differences in motivation are not eliminated with these data. However, they do provide some control for one rival hypothesis. Another possible rival hypotheses that might explain the higher numbers of students from the treatment group going on to college is the individual student's level of aspiration. It could be argued that perhaps the students who chose to enroll in the Partnership program were those that were already motivated to go on to post secondary education. However, counselors from the participating high schools report that students who already have college aspirations are more likely to enroll in advanced academic electives as opposed to a career preparation program.

Section Two: The Baldy View Health Careers Program
(Prepared by Dr. Larry Weigel)

The Health Careers Programs offered through Baldy View ROP have been developed to meet the needs of employers in the local area as well as to conform to the certification standards of the state of California. Like the model project, high school students enrolled in ROP courses in addition to taking on-campus academic classes to meet their high school graduation requirements. Students received high school credit and a certificate of achievement upon completion of the health careers program. Like the model project ,the curriculum is competency-based and approved by the California Department of Education. The length of the California Department of Education. These specific competencies must be acquired before a student is awarded the certificate. The classroom serves as a laboratory where student practitioners are provided simulated activities which closely parallel the kinds of activities the student would perform at the worksite (BVROP 1995).

Unpaid and paid worksite training is an integral part of these programs. After students achieve the classroom based competencies, they are placed in a business (hospital, convalescent center, etc.) site during the duration of the program. An Individualized training plan is developed for each student which specifically identifies the academic and technical skills the student will need to master in order to be certified as competently trained in the specific health care field. Worksite instruction is provided by the business where the student is placed. Personnel at the training site become mentors and teach the student specific competencies identified in the student's individualized training plan. Students are monitored weekly at their training worksite by the instructor to assess their training and to discuss with the worksite mentor the progress of each student.

Yearly follow-up is conducted to determine the success students who have gone through the program have had in securing employment as well as furthering their postsecondary education.

Analysis of Data

The courses involved in this study were those offered by Baldy View ROP in the school year 1991-1992 which included: Hospital services, Nursing Assistant, Medical Assisting, and Dental Assisting. The purpose of this study was to determine whether or not there was a significant difference between general education high school student who had completed occupational training in a regional occupational health careers program as part of the last two years of their high school course of study in regard to (1) high school graduation rates, (2) further training /education, (3) employment status, (4) rate of pay, and (5) job advancement.

Description of Sample

A total of 102 students was included in the final sample. Two groups of fifty-one students were matched on GPA at the tenth grade, ethnicity, and gender. More than half (67 percent) of the sample were minority, and more than 90 percent were female (see table 1).

Table 1
Gpa, Ethnicity, And Gender Of Samples In Study

Group/ Number	GPA	Minority	Nonminority	Male	Female
Group A (51)	2.43	34 (67%)	17 (33%)	5	46
Group B (51)	2.49	34 (67%)	17(33%)	5	46

Note: Group A students are those who completed health careers programs; Group B students are those who had no occupational education.

Findings

Descriptive statistics were generated using SPSS/PC 6.1 statistical software. Because of the careful, post hoc sampling (i.e., matching GPA, ethnicity, and gender), the confounds of sophomore grade GPAs, ethnicity, and gender between the two groups have been controlled. Group A's average tenth grade GPA was 2.43 and Group B's average GPA was 2.49.

1.   High School Graduation Rates:

A significantly larger proportion of students who had completed a health careers program graduated from high school than did those students who had no occupational education.

All students, 100 percent, who responded and who completed a health careers program graduated from high school. This was significantly different at the .05 level from the graduation rate (76.5 percent) of the general education students who had no occupational training in high school.

2.   Post-Secondary Enrollment:

Of those students responding who had completed a health careers program, 76.5 percent continued their education and were currently enrolled in college. This significantly differs from the 56.9 percent of general education students who were currently enrolled in college.

3.   Employment After Graduation:

The data indicate that there was a significant difference in the rate of employment at a significance level of .05 between students who had completed a health careers program and those who had no occupational

training in high school. Over 86 percent (86.3) of the students who completed a health careers program were employed two years after leaving high school as compared to 58.8 percent for general education students.

4.   Salary Differences:

Of those students who responded and were currently working, the data indicate a significant difference at the .05 level of confidence in the higher rate of pay for students who had completed a health careers program than the general education who had no occupational training in high school. More than 53 percent (53.7) of those students completing a health careers program were earning $8-13 per hour while less than 23 percent (22.6) of general education students were earning in that range.

5.   Job Advancement:

Job advancement was defined as a change in a job represented by an increase in wages, change of job title, assigned additional responsibilities, or a combination of these. The data show that over half (51 percent) of the number of students who completed a health careers program had received a job advancement compared to 11.8 percent of those who had no occupational training in high school. There was a significant difference in job promotion at the .05 level of confidence between students who completed health careers program and general education students who did not take occupational training in high school.

Section Three
Additional Career Majors in the East San Gabriel Valley Regional Occupational Program

In January 1996, data were gathered on 1,143 model project students who were enrolled in the career areas of Business, Industrial Technology and Medical Careers. Data were also gathered on 1,048 control students who were attending the same schools but were not enrolled in the medical project. Matched pair statistical analyses will not be completed until May 1996.

When the final matched pairing is complete, the percentages could change somewhat. Data have not yet been broken out to determine any comparisons among career paths. That will also be available in May 1996.

Preliminary follow-up data indicate:

➤   90.2% of former project students graduated from high school with their class as opposed to only 70.2% of control group students (controls are students from the same high school, same age, ethnicity and 10th grade GPA) That comes to a 9.8% high school drop out rate for project students as opposed to 29.8% drop out rate for control students.

➤ 52.8% of project students have gone on to post secondary education as opposed to 30.7% of control students

➤ 72% of project students are employed as opposed to 43% of control students. Of those employed, 20.8% of project students have received promotions as opposed to 5.5% of control students

Additionally, initial pre- and post-tests comparing students who completed an English/Business integrated curriculum indicate that students who completed the integrated activities-based curriculum scored 16% higher on criterion referenced post testing than did students who were taught the same skills, but in a traditional classroom manner.

Educational Significance of Results: Relationship of Results to Needs

The enterprise of education in America is faced with a number of challenges. Broad social changes such as the breakdown of the family, the rise of gang warfare in large urban areas, and huge influxes of non-English speaking immigrants bring a very different kind of student into today's schools. Advances in information and technology continue to rapidly transform the workplace requiring a differently-trained worker than was required a decade or a generation ago. Strong pressures from government and business continue to be exerted on schools to produce a labor force that will be competitive in the world's economic battlefront. Educators are challenged with designing innovative training programs which will meet the varied needs of a diverse population in an ever changing economy.

In an urban setting where broken families, new immigrants, and chronic poverty produce high school students who are at risk of alienation from school and society, there is an obvious need for innovative training programs that can capture students' imaginations, engage them in stimulating learning of both academic and practical skills, and motivate them to join the productive mainstream of society. The results of these studies demonstrate how career preparation programs that are carefully conceived and involve a broad array of businesses and other partnerships can be effectively implemented. For a program to be able to claim that high school students who choose to participate will have half-again as much chance of continuing into higher education, and twice the chance of being employed within the first few years out of high school, is evidence enough that the program has an advantage over the general track high school program. When this is topped with the claim that program participants have approximately four times the chance of being promoted within the first two-to-four years out of high school, then it becomes clear that this model can bring about some positive outcomes.

The educational significance of this particular model's success is that career preparation, when properly planned and delivered within the context of the existing business community can have a profound impact. Programs with the characteristics contained this model have the potential of revitalizing secondary career preparation. A healthy combination of academic and practical skills in the curriculum can attract and keep students interested in learning. The integration of services from a variety of agencies can smooth the transition from adolescence to adulthood. A shared responsibility with business and industry for training can insure the successful transition from school to productive work life. A strong network with institutions of higher learning can open the chance of a college education to underprivileged youth. Job placement is a key aspect of this model program for students nearing program completion. Viable employment options which provide for movement up the career ladder are an integral aspect of the model.

By utilizing a wide variety of community and other resources, the model is a cost-effective one that can be replicated in most school systems utilizing the varied and unique resources available in each community.

60

References

Becklund, L. (1991, September 22). Rage and Alienation Mark Suspects in Mall Murders. *The Los Angeles Times*. Pg. 1, 24, 25, Pt. 1.

Brooks, N. (December 16, 1992). Sluggish Economy May Linger in State: UCLA Raises Specter that State's Headache Could Persist. *The Los Angeles Times*. Pg. 1. Pt. D.

Brooks, N. & Sanchez, J. (1992, December 23). U.S. Firms Map Ways to Profit from the Accord. *The Los Angeles Times*. Pg. 1, Pt. 4.

Brown, N., Martin, D. & Mocker, D. (1988). Lessons Learned from Collaboration. *Urban Education*, v. 23, no. 1, pgs. 42-50.

Drucker, P. (1994, November). The Age of Social Transformation. *The Atlantic Monthly*, pp. 53-80.

Drucker, P. (1995, January). The Meaning of Today's Social Transformation. Speech Delivered at the Los Angeles Town Hall Meeting.

Education Resources Group, Inc. (1991). An Overview of Evaluation Research on *Selected Educational Partnerships*. United States Department of Education, Washington, D.C.

Flanigan, J. (1992, November 14). Can L.A. Answer Cry for Economic Equality. *The Los Angeles Times*. Pg. 1. Pt. 1.

Flanigan, J. & Lee, P. (1992, October 15). Major Impact Expected on Markets, Jobs, Wages. *The Los Angeles Times*. Pg. 1, Pt. 1.

Justin, M. & Kameen, M. (1986). School-Business Partnerships: Working to Defuse the Dropout Time Bomb. *NASSP Bulletin*. December 1986, pgs. 107-108.

Kotkin, J. & Friedman, D. (1992, May 15). Out of the Ashes: Start Small to Rekindle the Future. *The Los Angeles Times*. Pg. 2, Section T.

Marshall, R. & Tucker, M. (1992). *Thinking for a Living*. New York: Basic Books.

McMillan, P. (September, 1992). Spring Riots Continue to Haunt L.A.'s Economy. *The Los Angeles Times*. Pg. 1, Pt. 4.

Meyer, M. (1992). Los Angeles Will Save Itself. *Newsweek*. p. 46.

Nagel, T. (1992, November). Projections for the California Economy. Paper presented at the meeting of the California Merchandising & Marketing Association, Ontario, CA.

Nasar, S. (1992, December 27). Clinton Job Plan in Manufacturing Meets Skepticism. *The New York Times*. Pg. 1, Pt. 1.

National Center on Education and the Economy (1990). *America's ChoiceHigh Skills or Low Wages.* Rochester, New York.

National Commission for Employment Policy, (1985).

Osborne, D. & Gaebler, T. (1992). *Reinventing Government.* Massachusetts: Addison-Wesley.

Reich, R. B. (1994). Job Skills Split Middle Class Into Three New Groups. *Vocational Education Journal,* Volume 69, Number 8.

Reich, R. B. (1992). *The Work of Nations.* New York: Vintage Books.

Stone, N. (1991). Does Business Have Any Business in Education? *Harvard Business Review,* Mar/Apr, p. 46.

Thurow, L. (1992). *Head to Head The Coming Economic Battle Among Japan, Europe, and America.* New York: William Morrow and Co.

Weigel, L. (Jan. 1996) *Selected Differences Between General Education High School Students and High School Students Who Completed an ROP Health Careers Program.* University of La Verne Dissertation

Van Adams, A. (1991, November 12. Preparing for a World Market Economy. Paper presented at the American Vocational Association Conference, Los Angeles, CA.

Vartabedian, R. (November 15, 1992). L.A. Defense Job Losses Twice the U.S. Rate. *The Los Angeles Times.* Pg. 1. Pt. 4.

EDUCATION FOR EMPLOYMENT: AN ANALYTICAL FRAMEWORK RELATING SCHOOLING TO WORKFORCE PREPAREDNESS

Noemi Friedlander
Arlington, VA 22202

ABSTRACT

The purpose of the study was to develop an information-based analytic model that state officials, educators, business leaders and community groups can use as a tool to examine different school-to-work strategies and to develop new policy frameworks that tie education to employment concerns. This model uses a systems analytic approach to help (1) focus the attention of policy makers on the relevant components and variables they need to consider, and (2) direct policymakers to relevant data sources. Driven by the skills and knowledge demands of the workplace, the model shows the connection of work experiences to learning and schools to jobs.

Background

A great deal of interest currently exists in the United States in helping students transition from school to work. Two initiatives, both building on prior state efforts, are noteworthy because of their national scope and their potential for having a positive impact on all students. In 1994, Congress enacted the School-to-Work Opportunities Act (STWOA) (P.L. 103-239) to establish a national framework for the development of school-to-work opportunities systems. The STWOA provides states competitive venture capital grants to enable them to plan and develop school-to-work opportunities systems. Wisconsin Governor Tommy Thompson, 1995-96 chairman of the National Governors' Association (NGA) and the Education Commission of the States (ECS), has stated that he plans to move school-to-work initiatives to the top of all states' education agendas. ECS plans several activities, including maintaining a clearinghouse to help states examine different reform initiatives and develop their own effective strategies to link learning and work (Education Commission of the States, 1995). NGA will work with ECS and other groups to focus on the best strategies at the state and local levels (National governors' Association, 1995).

Both approaches place school-to-work strategies in the context of education reform and workforce development. Structurally, they include a school-based learning component, a work-based learning component, and a component that connects schools and workplaces. Pedagogically, both favor the integration of education and career preparation by means such as the integration of academic and occupational learning, and both promote removing fences between institutions by linking schools with workplaces and secondary with postsecondary programs. They also stress the importance of systemic, coherent policy development for the eventual success of school-to-work transition systems in the United States.

The main challenge of these initiatives is that their success hinges on bringing together different stakeholders--such as policymakers, educators, parents, business people, union representatives, and members of community-based organization--who have a variety of

63

perspectives and points of view and varying degrees of awareness regarding information sources that can help them work toward a common goal. Although a great deal of information relating to education and employment exists, no analytic models are available that direct those involved in the discussion and activity planning to relevant data sources in a systematic way.

Objectives

The purpose of this study is to develop an information-based analytic model that state officials, educators, business leaders and community groups can use as a tool to examine different reform initiatives and to develop effective strategies to link learning and work. This model can help:

1.   Focus the attention of policy makers and other stakeholders on the
       relevant components and variables they need to consider, and

2.   Direct these stakeholders to relevant data sources.

Driven by the skills and knowledge demands of the workplace, the model shows the connection of work experiences to learning and schools to jobs and provides a conceptual framework to assist in the process of developing systemic, coherent school-to-work systems.

Theoretical Framework

The model uses a systems analytic approach (Morgan, 1990). The systems approach is an information-based analytic process that offers a coherent perspective to conceptualizing education reform activities. It provides a tool to analyze job preparation and schooling at all levels in the context of the larger economy and helps organize information regarding the relevant components to be included in the process of developing new policy frameworks to help students transition from school to work.

Methods

To develop the model, the literature was reviewed in the fields of education, psychology, sociology, economics, political science, and public policy focusing on school-to-work and workforce preparedness issues. Numerous experts in these fields were consulted to help identify data sources that are important for developing a school-to-work transition strategy (Friedlander, 1990; U.S. General Accounting Office, 1993b; U.S. Department of Education, Office of Research, 1994; U.S. Congress, Office of Technology Assessment, 1995; Goldberg & Kazis, 1995; National Education Goals Panel, 1995).

Data Source

A thorough review of the literature in the fields of education, psychology, sociology, economics, political science, and public policy provides a theoretical basis for including the variables incorporated in the model. The major databases of the U.S. Department of Education, the Decennial Census of Population and Housing, the Current Population Surveys, the Michigan Panel of Income Dynamics, the National Longitudinal Surveys of Labor Market Experience, and the Occupational Employment Survey are important data sources for the variables included in the model. The Secretary's Commission on Achieving Necessary Skills (SCANS) (1991) contributes

64

the categories that describe what students need to know and be able to do to be productive after they leave school.

Results

The model consists of three components. These are the policy responses to key questions that are important to answer when developing a school-to-work strategy:

Question	Policy Response
(1) What do students need to know and be able to do?	(1) Set academic and skill standards.
(2) How can schools help students make a successful school-to-work transition?	(2) Design school-to-work and workforce preparedness strategies.
(3) Is the school-to-work strategy effective?	(3) Evaluate: (a) Assess student knowledge and skills. (b) Evaluate labor market and income effects of strategies.

This model also provides a preliminary list of (1) the variables that state officials, educators, business leaders and representatives of community groups can consider to answer the three fundamental questions regarding the development of new policy frameworks and (2) where to find data to assist the decision-making process and to evaluate the effects of the new strategies. A significant feature of this model is that it is demand-driven. It calls for incorporating information provided by employers to ascertain empirically what students need to know and be able to do in order to be prepared for the world of work.

Model Components--Key Questions and Their Respective Policy Response(s)
(1) What Do Students Need to Know and Be Able to Do?

Table 1: Set Academic and Skill Standards

Information	Data	Source

SCANS Workplace Know-HOW	Competencies
	  Resources
	  Interpersonal skills
	  Information
	  Systems
	  Technology
	The foundation
	  Basic skills
	  Thinking skills
	  Personal qualities
		The Secretary's
		  Commission on Achieving
		  Necessary Skills
		U.S. Department of Labor

Skill standards	Industry skill standards	U.S. Department of Labor Skill Standards Board

Academic standards	Academic standards
	  development projects
		National Education Goals
		  Panel Inventory

(2) How Can Schools Help Students Achieve Academic and Skill Standards?

Table 2
Design Effective School-to-Work Strategies

Information	Data	Source

Work-based learning component:
  Develop occupational competencies for all students
 	
  Meaningful workplace experiences for all students
	U.S. General Accounting Office (1993a)
	Skill standards demonstration projects
	
	Existing Industry Skill Standards
		National Education Goals Panel
		Jobs for the Future
		U.S. General Accounting Office
		School-to-Work Opportunities Act
		National Institute for Automotive Service Excellence

School-based learning component: Develop academic competencies for all students	National Education Goals Panel inventory of academic standards projects	National Education Goals Panel Jobs for the Future U.S. General Accounting Office School-to-Work Opportunities Act
Connecting activities: Extensive links between schools and employers	Career education and development Diplomas Portfolio record systems	American Counseling Association ACT WorkKeys National Center on Education and the Economy ETS WorkLinks

Table 3
Design Workforce Preparedness Strategy

Information	Data	Source
Set goals and performance criteria	Skill standards Academic standards	U.S. and State Departments of Labor National Skill Standards Board National Education Goals Panel

Analyze E&T needs	Present
	   Demand for S&K
	   Supply of S&K
	Forecast
	   Demand for S&K
	   Supply of S&K
		U.S. and State Departments of Labor
		State and local business surveys

Survey delivery system components	Context
	   Environment
	   Governance
	   Management
	Learners
	   Labor market status
	   Personal characteristics
	Resources
	   Physical
	   Financial
	   Instructional
	Community groups
		U.S. and State Department of Education
		U.S. and State Department of Labor
		School districts and schools
		U.S. and local Chambers of Commerce

Design delivery system	Effective school-to- work strategies Schooling at all levels Work-based job preparation	School districts, schools and postsecondary institutions Workplaces
Implement	State and local school- to-work strategies	School districts, schools and postsecondary institutions Workplaces

(3) Is the School-to-Work Strategy Effective?

Table 4
Assess Student Knowledge and Skills

Information	Data	Source
Assessments based on skill standards	Skill standards Assessment systems	Selected industries
Assessments based on academic standards	Academic standards Assessment systems	Selected states

67

Table 5: Evaluate Labor Market and Income Effects of Strategies

Information	Data	Source
Labor market performance of graduates	For students who have completed programs based on strategies: Labor market participation rate Unemployment rate K&S utilization in present job	School district or state records Bureau of Labor Statistics Does not exist at present (O*NET will provide in the future)
If labor market performance poor: wrong effectiveness criteria?	Academic standards Occupational skill standards SCANS skills and competencies	Assess student performance
If effectiveness criteria OK: poor program results?	Assessment of student performance Test scores Performance appraisals	School districts, schools and postsecondary institutions Workplaces

If program results poor: due to what program inputs?	Context
	  Environment
	  Governance
	  Management
	Learners
	  Labor market status
	  Personal characteristics
	Resources
	  Physical
	  Financial
	  Instructional
	Community groups
		School districts, schools and postsecondary institutions
		Workplaces

Income of graduates	Short term Long term	Follow-up surveys of graduates
If income results poor: due to program features or conditions in the economy?	Follow-up data on graduates Control group Data on the performance of the economy	Follow-up surveys of graduates Follow-up data on control group Bureau of Labor Statistics

Educational Importance of the Study

Both the STWOA and Governor Thompson stress state and local flexibility in developing school-to-work systems. This study is important because it contributes an information-based theoretical model with a coherent perspective to help organize the information that goes into framing school-to-work system development discussion and activity. The model can be especially useful in that it can point to available data sources spread over a large number of agencies and institutions at all levels of government and also highlight data gaps, thus avoiding fruitless searches for non-existent information.

Its structure lends itself to a continuous improvement process that enables all the stakeholders to participate in setting goals and performance criteria, evaluating performance, and setting new goals for the system based on evaluation data. The model can also be regarded as an instrument for diffusion of evaluation technology, bringing accountability tools closer to the users and clients of the system.

Next Steps

The preceding tables are a first attempt at identifying and organizing the specific information needed for developing school-to-work systems. These tables must be refined. Different users can then select appropriate information for their particular needs. Users can also develop formats that are suitable for their particular needs.

References

Education Commission of the States. (1995). *Connecting Learning and Work*. Denver: Author.

Friedlander, N. (1990). *Analysis of the Data Available to Develop the Human Resources Needed by the Nation's Employers for Economic Competitiveness*. Doctoral dissertation, Teachers College, Columbia University, New York.

Goldberg, S., & Kazis, R. (1995). *Revitalizing High Schools: What the School-to-Career Movement Can Contribute*. Washington, DC: American Youth Policy Forum, Institute for Educational Leadership, Jobs for the Future, and National Association of Secondary School Principals.

Morgan, R. N. (1990). Systems Design and Educational Improvement. In D. W. Chapman and C. A. Carrier (Eds.), *Improving Educational Quality: A Global Perspective* (pp. 66-85). Westport, Connecticut: Greewood Press (Praeger).

National Education Goals Panel. 1995). *Inventory of Academic Standards-Related Activities*. Washington, DC: Author.

National Governors' Association. 1995). Washington, DC: Author.

School-to-Work Opportunities Act of 1994. (1994). Public Law 103-239, 108 Stat 568.

U.S. Congress, Office of Technology Assessment. (1995). *Learning to Work: Making the Transition From School to Work*. Washington, DC: Author.

U.S. Department of Education, Office of Research. (1994). *School-to-Work: What Does Research Say About It?* Washington, DC: Author.

U.S. Department of Labor, The Secretary's Commission on Achieving Necessary Skills. (1991). *What Work Requires of Schools: A SCANS Report for America 2000*. Washington, DC: Author.

U.S. General Accounting Office. (1993a). *Skill Standards: Experience in Certification Systems Shows Industry Involvement to Be Key*. Washington, DC: Author.

U.S. General Accounting Office. (1993b). *Transition From School to Work: States Are Developing New Strategies to Prepare Students for Jobs*. Washington, DC: Author.

CONDUCTING SUCCESSFUL SCHOOL-TO-WORK TRANSITION PROGRAMS: TEACHER EXPERTISE AND PROFESSIONAL DEVELOPMENT NEEDS

Curtis R. Finch

and

B. June Schmidt

and

Margaret Moore
National Center for Research in Vocational Education Site
Career and Occupational Studies
Virginia Polytechnic Institute & State University

Abstract

This study focused on the expertise teachers must have to function effectively in school-to-work (STW) transition settings. Information about teacher expertise was gathered via community profile studies. Persons interviewed at selected sites in different states around the United States included academic and vocational teachers, administrators, students, and counselors; as well as business, industry, and community representatives. Information gathered during the visits was examined using qualitative methods. The results have several implications for changing the ways teachers are prepared and the manner in which professional development is provided to those who are currently teaching.

Overview

Passage of the Carl D. Perkins Vocational and Applied Technology (Perkins II) Act in 1990 ushered in a new era of preparing students to enter and succeed in the workplace. Among other things, the Perkins II legislation shifted emphasis from a reactive and rigid curriculum and instructional model to one that is more proactive and flexible. In contrast with earlier legislation that contributed to a wide separation between academic and vocational instruction, the Perkins II Act supported integration of academic and vocational studies. Also included in the Act were provisions for linking high school and post-high school studies in creative ways via Tech Prep. This landmark legislation appears to have had positive and meaningful impact on students; however, it has also provided educators with many implementation challenges.

The School-to-Work Opportunities Act of 1994 expanded on Perkins II's proactive elements by allowing states to combine federal education and job-training program moneys so more

meaningful school-to-work activities could be provided. In order to receive funding from the School-to-Work legislation, programs are required to include three components: school-based learning, work-based learning, and connecting activities that link school- and work-based activities. The School-to-Work Act is seen by many as legislation that "brings it all together" to form a powerful system. And since school-to-work involves educators and business, industry, public service, and community representatives in running the system; the organization, articulation, and collaboration activities can be daunting. This especially the case for educators in general and teachers in particular. Most teachers have not been prepared to actively engage in activities associated with a school-to-work system. Additionally, they do not perceive students' transition from school to work as an integral part of their teaching and may give little or no effort to interfacing with employers. Kazis and Barton (1993, p.21) indicate that linking school with work will require extensive teacher professional development to provide teachers with the knowledge needed to build programs with work-related experiences as well as new methods of assessment that will help students transition to work.

Purpose

Most teachers' current experiences are school-based and have not included ways that meaningful linkages can be created so students may be assisted as they transition to work. Deep-rooted tradition has led to school personnel viewing school-based learning as separate from work-based learning. The challenge, then, is provide all teachers with opportunities to gain occupational-related knowledge, instructional expertise, and associated attitudes needed to interface effectively with employers (Pauley, 1994). To meet the school-to-work goal of moving from isolated programs to a system that helps large numbers of students successfully transition to work, all school personnel must support the effort. As Stern, Finkelstein, Stone, Latting, and Dornsife (1994) note, "Within schools, major decisions must be made about the curriculum of school-to-work programs." They continue, "Building integrated school-to-work programs for large numbers of students will require the active collaboration of non-vocational teachers and departments" (p. 143).

However, before teachers can be provided with professional development experiences that assist them to function effectively in school-to-work transition roles, it is necessary to identify the school-to-work expertise these teachers must understand and be able to apply in their teaching positions. Also of great importance is knowledge about ways teachers can be professionally developed so their potential for success in school-to-work settings is enhanced. In this study, we focused on the expertise teachers must have to function effectively in school-to-work transition settings. This included identifying ways that teachers' school-to-work activities link with the workplace and determining the types of professional development activities these teachers will need. Answers were sought to two questions: first, what teacher activities that link with business, industry, and the community contribute to school-to-work system success? and second, in which school-to-work professional development activities are these teachers engaged?

Conceptual Framework

This study builds on the rich heritage of professional development, but more specifically on recent conceptions of professional development in an era of educational reform. Professional development (sometimes termed personnel development, staff development, and in-service education) has traditionally been the responsibility of colleges and universities. These institutions have tended to focus a great deal on preservice teacher education and somewhat less on in-service education. However, numerous changes in the ways public schools operate as well as what is

71

taught and how it is taught have had a profound effect on educators and the ways they develop on the job (Little, 1993). For example, the implementation of Tech Prep, academic and vocational education integration, school-to-work transition, and other educational reforms have shown that teachers must be prepared to work at diverse tasks including functioning as members of interdisciplinary and school/community/workplace teams and engaging in collaborative curriculum development and teaching (Finch, Schmidt, & Faulkner, 1992). Organizational reform such as school-based management has provided teachers with opportunities to become involved in the total school enterprise and participate in decisions that affect its future direction.

Over the past ten years, several frameworks for professional development have emerged that appear to encompass the evolution of and revolution in teachers' professional roles. Taking a rather generic view, Finch (1989) noted that professional development was evolving into a more comprehensive set of phases that include: needs, focus, delivery, and impact. Needs are "derived from the contexts within which professional development will take place and the types of potential professional development recipients" (p. 6). Professional development focus is driven by needs and context as well as content to be delivered and potential benefit to recipients. How professional development is delivered thus becomes a function of needs, focus, context, potential delivery modes, and potential delivery settings. And finally, assessing professional development's impact is a function of context, needs, focus, and delivery.

More recently, Finch, et. al (1992) presented a vision of an evolving professional development paradigm. Within this paradigm, consideration is given to teachers' new professional roles in the schools as well as how professional development needs that are generated by these new roles should be met. Professional development assumes a new character that includes greater emphasis on:

> school-based development instead of university-based programs
> teachers teaching teachers,
> teacher team development as contrasted with individual development
> continuous rather than intermittent professional development activities,
> informal opportunities for professional development
> teacher self-governance and decision making in meeting professional development needs. (p. 5)

Support for this paradigm, upon which our study was based, may be found in several sources including Schmidt, Finch, & Faulkner's (1992) study of teachers' roles in the integration of vocational and academic education, Little's (1993) comprehensive essay on professional development in a climate of educational reform, Sparks' (1994) discussion that documents reasons for a paradigm shift in staff development, and Bull & Buechler's (1995, March) in-depth study of professional development in Indiana. As this research was conducted, we also gave consideration to teachers' needs and the contexts within which these needs were generated, the focus of professional development, the various ways that professional development was delivered, and its impact (Finch, 1989).

Procedures

Information about teacher involvement in school-to-work transition was gathered via community profile studies. The communities participating in the study were selected based on several criteria including (a) the extent and effectiveness of school-to-work linkages and other involvement between schools and employers, (b) the extent to which school- and work-based programs were fully operational and graduating students from these programs, and (c)

72

documentation of the long-term commitment that schools, employers, and the community have made to school-to-work transition. Nominations for sites selected were sought through mailed surveys to state school-to-work coordinators from across the U.S. In addition, key individuals were telephoned in five states based on information in the literature about on-going state and local school-to-work activities.

The complete study spans a two-year time frame with information collected from ten to twelve sites. For this paper, outcomes are reported from information collected at three sites. At each of the sites, information was gathered from teachers, administrators, counselors, employers, and business, industry, and community representatives. These were individuals involved in school-based learning, work-based learning, and activities linking school-based and work-based learning at the three sites. The primary information collection approach was the long interview, with a total of 44 interviews conducted at the sites. Included in the interview protocol were questions and probes designed to assist interviewees in identifying and describing best school-to-work practices teachers had used at each site, including those where they interfaced effectively with employers. The critical-incident technique was used in the protocol to help interviewees focus on describing examples of teachers' best practices. In addition, questions were asked that focused on identifying professional development activities having the greatest positive impact on teachers, with the critical-incident technique again used to stimulate interviewees' descriptions.

Following Lofland's (1971) and Miles and Huberman's' (1984) recommendations, analysis and interviewing were conducted concurrently. The analysis centered on identifying meaningful themes and subthemes associated with teachers' school-to-work involvement and contributions imbedded in the interview text and on determining to what extent common elements existed across sites. To handle the extensive text transcribed from the interviews, *The Ethnograph* software was used. This software allows for coding, grouping, coding again, and regrouping information according to established and emerging categories, themes, and contexts.

Results: Teacher Activities That Contribute to School-to-Work Success

Interviewees were presented with several questions related to teacher school-to-work activities. First, they were each asked to identify teacher activities that were linked to the workplace; and second, they were asked to describe one of those activities that made the greatest contribution to student school-to-work transition. An examination of teacher activities that were mentioned by interviewees as greatest contributors to student STW success resulted in the establishment of several teacher activity themes. These themes include (1) involving students in organized on-the-job experiences, (2) helping students to understand the workplace, (3) involving workplace representatives in school curriculum and instruction, (4) providing student workplace experiences through school activities, (5) including a workplace focus in school instruction, (6) creating informal linkages between the school and the workplace, and (7) learning about the workplace in ways that contribute to better teaching. The seven themes and examples of each appear in Table 1. Examples of interviewees' comments about different activities serve to support the various themes.

Involving Students in Organized On-the-job Experiences

Several interviewees commented about the value of involving students in organized on-the-job experiences. One person discussed how students' on-the-job experiences helped them to develop. He indicated that most of the students who come to him are getting ready for their first

73

Table 1. Teacher Activities That Contribute to School-to-Work Success

CONTRIBUTORS TO SUCCESS	EXAMPLES
Involving students in organized on-the-job experiences	students shadowing and mentoring in the workplace students engaged in cooperative work experiences students interning in the workplace
Helping students to understand the workplace	students taking field trips to business and industry teachers completing internships in the workplace
Involving workplace representatives in school curriculum and instruction	advisory committees providing curriculur recommendations guest speakers presenting information ab‹ the workplace
Providing student workplace experiences through school activities	students completing design projects for l‹ industries students building houses in the communit students catering business luncheons
Including a workplace focus in school instruction	teachers providing applied lab instruction teachers providing applied academic instruction teachers integrating curriculum and instr‹
Creating informal linkages between the school and the workplace	teachers visiting the workplace to promo‹ their students as potential employees employers seeking advice from teachers teachers seeking advice from employers teachers working part-time in industry
Learning about the workplace in ways that contribute to better teaching	teachers completing internships in the workplace teachers working part-time in industry

jobs and are "nervous about meeting the public." The job experience "brings them out of their little shells they are in and they learn how to communicate and how to be more polite to people."

Helping Students to Understand the Workplace

Students can only learn so much about the workplace through instruction in the school. Thus, experiences such as field trips to business and industry assist students in linking their knowledge about the workplace with actual examples. An interviewee from industry noted that field trips in the workplace show students "that in real life you have to know basic science and

74

math." A high school computer teacher commented that field trips gives students a view of the real world. "In some places we go, (the students) can see that you do not have to dress up but you have to wear equipment, so there would be safety devices. They can look at the ergonomics of it, the software of it, the skills they would need." It was also felt that teachers who completed internships in the workplace were in a better position to help students understand the workplace. A school-to-work coordinator noted that some teachers who took the internships said "they realized the need for teamwork. Teaching teamwork. Teamwork in the workplace is very important."

Involving Workplace Representatives in School Curriculum and Instruction

Involving workplace representatives in school curriculum and instruction centered on two more traditional ways of linking the school and the workplace: advisory committees and guest speakers. However, at one location we visited, there was a active speaker's bureau that obtained the names of speakers and the topics they would discuss and shared the information with educators. This saved teachers much time if they were searching for speakers that focused on certain areas.

Providing Student Workplace Experiences Through School Activities

Students had several opportunities to gain meaningful workplace experiences under the direction of the school. Examples included completing projects for local industries, building houses in the community, and catering business luncheons. An interviewee who worked for a public utility commented on the value of this type of experience, noting that "the important aspect of the whole thing is that the student can see what (he or she) is learning in the worksite classroom can benefit (him or her) beyond (his or her) formal education." "So many times, students get discouraged and drop out of school because they think what they are learning is not really of benefit to them. This practical application conveys (a direct benefit) to them in a very clear manner."

Including a Workplace Focus in School Instruction

Mention was also made of providing instruction with a workplace focus. Instruction ranged from offering more traditional applied laboratory instruction to the collaboration of academic and vocational teachers. A curriculum coordinator believed that the greatest contributor to student success was the collaboration between academic and vocational teachers. The coordinator noted "hearing of students that are interested in entering other fields and occupations that I have never heard them talk about before and I know this is a result of knowing there are other opportunities out there for them."

Creating Informal Linkages Between the School and the Workplace

Creating informal linkages is an important and yet seldom mentioned teacher activity. These linkages included instructors seeking advice from employers and employers seeking advice from instructors. A more traditional means of linking with the workplace was for teachers to work part-time in industry. However, one factory administrator noted that teachers coming into their plant on an informal basis to meet with employees had much impact on student success. This person indicated that "students, who have been through the classes where teachers have tried to include learning experiences that they are learned from us, are much more focused and ready to come to work."

75

We noted that teachers' experiences in the workplace seemed to contribute positively to their teaching. This was most frequently mentioned in regard to teachers completing internships in the workplace. At one school site we visited, business, industry, government, the schools, and the local Chamber of Commerce were all collaborating on a "back to industry" program that enabled teachers to intern with different companies. Many people we interviewed praised the program and its benefits. This program is also discussed in a later section focusing on teacher professional development.

Professional Development Experiences

Responses to questions aimed at determining interviewees' perceptions of professional development activities teachers participated in that helped them conduct successful school-to-work activities were classified in eleven themes: involving students in workplace experiences; gaining work experience; visiting the workplace; taking coursework; participating in conferences; using student organizations; learning through students; obtaining materials and equipment from business, industry, and the community; reading in teaching area; participating in in-school professional development; and interacting with business and industry. The themes and examples of each appear in Table 2.

The following quotes selected from the interview transcripts support the eleven themes listed in Table 2. A response that illustrates **involving students in workplace experiences** was made by one school-to-work coordinator who described a meeting of local employers with students as follows:

> . . . It [the meeting] also gave the teachers an opportunity to listen to what questions their students were asking. What was presented by this panel helped Mike [the welding teacher] when he came back to school so that he was better able to, . . . if one of the students expressed an interest in a particular type of welding, gear his program a little bit more for that student. He knew the student's interest level and knew there might be a potential job out there for the student. This way Mike could better instruct that student so the student could be successful.

Teachers, administrators, and business/industry representatives interviewed were enthusiastic about teachers' **gaining work experience** through the back-to-industry programs that have been implemented at the two sites. The following two quotes, the first by an academic teacher and the second by a school-to-work coordinator, exemplify interviewee responses.

> . . . Well, I think the back-to-industry program was a wonderful experience and I hope every teacher in our school gets to participate in that, just so each teacher can see what our people in this county are having to do..what they are doing and that's bringing a lot of textiles and jobs for the parents and for the kids both.

> . . . I think one of the things that the back-to-industry program has done is that it has given teachers an awareness of what employers are looking for, and they are bringing that information back to their classrooms and incorporating it into their lessons...and that's advantageous... It's not just vocational students, it's all our students who are benefiting, because the teachers that are involved in back-to-industry represent all different disciplines.

76

Table 2. Professional Development Activities

ACTIVITIES	EXAMPLES
Involving students in workplace experiences	Plant tours Taking students to professional conferences
Gaining work experience	Back-to-industry Job shadowing Summer jobs
Visiting the workplace	Learning what the industries do
Taking coursework	On-going continuing education Technical up-dating
Participating in conferences	Summer conferences Workshops
Using student organizations	Meeting individuals in others schools at student organization conferences and learning what they doing
Learning through students	Learning from students knowledge of local busir and industry (knowledge gained from parents or personal work experience)
Obtaining materials and equipment from business, industry, and the community	Obtaining equipment, newspapers, and journals local businesses for classroom use
Reading in teaching area	Reading literature and trade journals to stay curi teaching area and learn of latest technological developments
Participating in in-school professional development	Staff development opportunities provided by the school system
Interacting with business and industry	Brainstorming Advisory committees

In addition to gaining work experience, teachers are also **visiting the workplace** to learn about local industries. An academic teacher responded as follows:

> Just knowing what the plants in our county do. I'd never been in these plants and I didn't know what they actually did and what they contribute to the county tax base; the tax dollars they give us, the jobs they give our people. . . I know a few teachers here that are taking a group of students on plant tours to see what these plants do and that's opened up opportunities for us. We're more involved with our plants now and they're more willing for us to come because they know that we're getting their workers ready for them.

A professional development activity frequently mentioned during the interviews was **taking coursework** for educational and technical up-dating. The two responses that follow are from vocational teachers.

77

. . . at different community colleges, if I know they have something pertaining to my field, I search the course of studies and if there is a course relating to drafting that I need to take then I do it.

. . . the software changes so frequently and we don't change that frequently at schools. So often, I have to do an update myself because the colleges have new releases and we pretty much stick with what we have now. I work with the kids and try to share information and let them know what the industries have [software] at this point and how if they were to go to work in a particular industry, maybe different terminology and so forth, and how it would transfer to what we have.

Participating in conferences was mentioned by a number of respondents as being an effective professional development activity providing meaningful activities and materials that enabled them to conduct successful school-to-work activities. A vocational teacher who was particularly enthusiastic about the positive results of participating in conferences responded in the following manner:

The summer conference workshops, we attend those regularly. And we meet with other teachers across the state that provide ideas on what works for them and we just find out general information that helps us in the whole process [school-to-work]. It's the best way to get inside motivation before school starts; it's really an uplift. Sharing with other teachers, it's just a real stimulating type thing that you can go and hear about what others are doing and you get excited. You get new ideas; it's just a rejuvenation.

A vocational teacher spoke about using **student organizations** as a professional development activity.

FBLA trips help out a lot, we get to travel immensely. We go from region, to state, and then to national. So they're competing with 49 other states.

The following two responses are from teachers who said that **learning through students,** knowledge of the workplace and technical expertise was an important part of their professional development. The first response is from an academic teacher and the second is from a vocational teacher.

By working there in every single plant in this county, the students learn that they just do not show up for work and just the importance of being there. We have an attendance policy and if you miss so many days you fail the class just like if you miss so many days of work you're fired.

Because the way that technology changes, especially in my classes, I've got to have new ideas, new things for the kids to do. A lot of them have 586 processors at home and they come in and they get the opportunity to share that with the class. I have two kids right now when I left my class that were instructing the other kids how to use "Sim City."

Teachers responded that they **obtain from materials and equipment from the community, business, and industry.** One academic teacher reported that he picked up

78

newspapers every week from a local business to be used for news items, and a vocational teacher reported on obtaining software as follows:

. . . I've got a brand new database package that is coming to me right now. A student brought in the brochure and I talked to the manager and he gave me a month's use free for 22 kids and then I can decide to purchase.

Reading in the teaching area, literature and trade journals, was a method reported by interviewees for keeping current in their teaching areas and learning of the latest technological developments. The following responses, the first by a coordinator and the second by a vocational teacher, support this way of staying abreast of what's going on in the field.

I don't think we have anybody who is not really working hard to do a good job. We have in every vocational program our teachers working hard at keeping themselves up-to-date whether by reading, by visiting the workplace, or by taking classes.

Basically reading. I read books that help keep me focused. . . so I don't get sloppy and off-track.

Staff development opportunities provided by the local school system was viewed by many educators as an essential part of their professional development that helped them conduct successful school-to-work activities. The following quotes from a coordinator and an academic teacher stress the importance of **participating in-school professional development.**

This summer, a lot of our workshops are going to be school-to-work activities; and the school provides staff development here on campus for us. We are very fortunate in that we have a full-time staff member that has been provided that is a school-to-work person. She kind of guides and leads us.

We have a staff development day every year and I get a tremendous amount of knowledge and appreciation for the people that I work with from those days. Also, an understanding of how I fit into this organization and then I can pass that on to my students.

And last, to support the category of **interacting with business and industry,** a school-to-work coordinator remarked:

. . . We did have a kind of brainstorming session with the education committee of the Chamber of Commerce about a year ago, and there were some teachers involved in that brainstorming session, of what things can we do to better forge a link with industry.

Discussion

Teachers engaged in school-to-work efforts utilized a number of traditional activities to enhance the quality of their teaching and were engaged in several traditional approaches to professional development. However, they also employed many more creative ways of bringing the school and the workplace closer together.

It should first be noted that teachers were not the only persons involved in establishing successful school-to-work activities. Educational administrators, supervisors, and counselors as well as business, industry, and community representatives were actively engaged in organizing and sustaining many of these activities. Additionally, positive and supportive climates existed in each of the sites we visited. Our interviews revealed that support for school-to-work transition was present the highest levels of education, the workplace, and the community. And the more comprehensive and successful school-to-work activities often involved teams of people rather than individuals. These observations align with several conditions that are necessary for successful change. Of the barriers to educational change cited by Harvey (1990), lack of ownership, lack of benefits from change, and lack of support from higher administration appear to be among the most common. At the sites we visited, ownership, benefits, and support were contributors to the school-to-work "system."

A second observation relates to the linkages that exist between teachers' school-to-work activities and their professional development. Although we did not look for causal relationships between teachers' professional development activities and the ways they subsequently taught their students, we noted several instances where professional development and teaching activities were closely linked. A case in point consists of teacher professional development internships in the workplace. Several educators and workplace and community representatives cited teacher internships as activities that contributed the most to school-to-work success. In their view, teacher internships contributed directly to more relevant teaching.

And finally, the sites we visited seemed exemplify the African proverb that "it takes a village to raise a child." In this case, the villages consisted of people in schools, communities, and local businesses, industries, and governments who collaborated in school-to-work transition. Although individual teachers have in the past and will continue to operate independently of others, success in the future will be measured to a much greater extent by how well teachers team and collaborate with others in the long term to provide students with quality school-to-work experiences.

References

Bull, B., & Buechler, M. (1995, March). *Time for professional development*: Ideas for Indiana. *Policy Bulletin*. Indiana Education Policy Center, p. 1.

Finch, C. R. (1989). *Challenges facing vocational education personnel development*. Paper presented at the Pennsylvania Vocational Teacher Education Forum, Harrisburg.

Finch, C. R., Schmidt, B. J., & Faulkner, S. L. (1992). *Using professional development to facilitate vocational and academic education integration: A practitioner's guide.* (MDS-277). Berkeley, CA: National Center for Research in Vocational Education, University of California, Berkeley.

Finch, C. R., Schmidt, B. J., & Oliver, J. D. (1992). *Course-taking patterns of vocational teacher education baccalaureate degree recipients: Teacher preparation, general education, and teaching content area studies.* Berkeley, CA: National Center for Research in Vocational Education, University of California, Berkeley.

Harvey, T. R. (1990). *Checklist for change: A pragmatic approach to creating and controlling change.* Needham Heights, MA: Allyn & Bacon.

88

Kazis, R., & Barton, P. E. (1993). *Improving the transition from school to work in the United States.* Washington, D.C.: American Youth Policy Forum.

Little, J. W. (1993). Teachers' professional development in a climate of educational reform. *Educational evaluation and policy analysis.* 15(2), 129-151.

Lofland, J. (1971). *Analyzing social settings: A guide to qualitative observation and analysis.* Belmont, CA: Wadsworth.

Miles, M. B., & Huberman, A. M. (1984). *Qualitative data analysis.* Beverly Hills, CA: Sage.

Pauley, E. (1994, March). *Principal conclusions from the school-to-work transition project.* Paper presented at the Policy Seminar of the American Vocational Association, Washington, D.C.

Schmidt, B. J., Finch, C. R., & Faulkner, S. L. (1992). *Teacher's roles in the integration of vocational and academic education.* (MDS-275). Berkeley: National Center for Research in Vocational Education, University of California, Berkeley.

Sparks, D. (1994, March 15). A paradigm shift for staff development. *Education Week,* p. 42.

Stem, D., Finkelstein, N., Stone, J. R., Latting, J., & Domsife, C. (1994, March). *Research on school-to-work transition programs in the United States.* (MDS-771). Berkeley, CA: National Center for Research in Vocational Education, University of California, Berkeley.

A CASE STUDY ANALYSIS OF TWO SCHOOL-TO-WORK TRANSITION PARTNERSHIPS

Michael J. Berson

and

Nick Elksnin
The Citadel
Charleston, South Carolina

ABSTRACT

This project involved the implementation of a pilot protocol to study The Health Care Youth Apprenticeship, a partnership between Rochester City School District, Rochester General Hospital, and Strong Memorial Hospital, and the Eastman Kodak Youth Apprenticeship, a partnership between Eastman Kodak Company and Rochester City School District. Preliminary analysis of the data suggests that certain components of the educational process are vital to the success of school-to-work transition partnerships, including administrative support, integration of applied curriculum, implementation of a comprehensive participant selection process, formal social skills instruction, training in and the opportunity to use reflection, and family involvement.

Introduction

Industry has become concerned that qualified, well-trained workers will not be available for the future. As a result of this concern, numerous business-school partnerships have been established, but these alliances have not provided the quick fix solution that might have been expected. In the 1990s, high school dropout rates have reached disturbing proportions, and companies continue to struggle in their search for qualified entry-level workers. Changes in the workplace, including increased reliance on technology, information analysis, and group interaction, require a highly skilled and educated labor force that can apply knowledge, integrate information across disciplines, and engage in collaborative problem solving. While the public severely criticizes the current educational system, society must determine if a new skilled work force can be developed without a basic overhaul of America's educational institutions.

Most recently, national support for the restructuring of schools to incorporate school-to-work programs achieved an historic turning point in May of 1994 when President Clinton signed the School-to-Work Transition Law which supports the funding of programs to facilitate the transition from education to employment. With the investment of financial and human resources into school-to-work initiatives, the efficacy of these programs must be evaluated to allow for maximum educational and societal benefit.

The purpose of the project was to evaluate two school-to-work transition partnerships: (1) The Health Care Youth Apprenticeship, a partnership between Rochester City School District,

Rochester General Hospital, and Strong Memorial Hospital, and (2) the Skilled Trades Youth Apprenticeship, a partnership between Eastman Kodak Company and Rochester City School District. Specifically, this project entailed the collection and analysis of anecdotal information by interviewing and surveying students and representatives from the school district, Eastman Kodak, Rochester General Hospital, and Strong Memorial Hospital. Students who had withdrawn from the youth apprenticeship programs also were interviewed and surveyed. The resulting case study provides an idea of what happens to students after they experience a youth apprenticeship, and the subsequent information may guide developers in modifying and ameliorating existing programs.

Procedures: Research Questions

Through this research, the investigators intended to answer the following questions:

(1)   How are school staff structuring courses to enhance work-based experiences?

(2)   What strategies have students in the Youth Apprenticeship Programs implemented to fulfill their responsibilities at work and achieve success in school?

(3)   How have Eastman Kodak, Rochester General Hospital, and Strong Memorial Hospital created learning environments which encourage students' personal, academic, and work-related successes?

Methods

A case study approach involving an in-depth, analytical description of a school-to-work transition program was employed. This research relied heavily on observation, description, and qualitative interpretations of the phenomena observed. Extensive field notes and student, teacher, and personnel interviews were conducted.

Instrumentation

A formal interview instrument was designed by the investigators following a meeting with the Rochester School-to Work Steering Committee. Additional data was gathered on students' standardized test scores, and formal evaluations of their school and work skills were collected. This research required a two-step process involving the initial collection of data to establish an assessment protocol and a follow-up on-site investigation to implement the pilot protocol. The Youth Apprenticeship Program Evaluation Instruments (YAPEI) were comprised of five components, including the Youth Apprentice Program Evaluation Instrument (See Appendix A), Youth Apprentice- Students Who Withdrew Program Evaluation Instrument, School Personnel Program Evaluation Instrument, Work Site Personnel Program Evaluation Instrument, and Youth Apprenticeship Coordinator Program Evaluation Instrument.

Subjects

The participants in this study were the students, teachers, school-to-work transition team members, and work site liaisons involved in the (1) Eastman Kodak Company/Rochester City School District Skilled Trades Youth Apprenticeship Program and (2) the Rochester General Hospital/Strong MemorialHospital/Rochester City School District Health Care Youth Apprenticeship Program. Ten skilled trade students, including nine males and one female, and five

school and work personnel (three men and two women) from Eastman Kodak Company/Rochester City School District along with fourteen health care students, including twelve females and two males, and eleven personnel (nine women and two men) from the Rochester General Hospital/Strong Memorial Hospital/Rochester City School District Health Care Youth Apprenticeship Program completed the instruments.

The students who were completing their experiences in two school-to-work transition projects were selected from Edison Tech High School and Franklin High School's Bioscience and Health Careers Academy in Rochester, New York. This site was of great interest because it is associated with several nationally recognized organizations, including The National Center on Education and the Economy, The Eastman Kodak Company, Rochester General Hospital, and Strong Memorial Hospital. Moreover, the Rochester City Schools have become nationally known for their innovative educational practices and model educational programs, such as the school-to-work transition project. As referenced in the U.S. General Accounting Office Report to Congressional Requesters entitled Transition from School to Work: States are Developing New Strategies to Prepare Students for Jobs (1993), the Kodak-Rochester School Alliance is recognized as a unique situation due to the active leadership of the business community in establishing ties with the city schools.

Results and Recommendations

The youth apprenticeship is considered to be the most intensive path for training in vocational content areas. To further understand the dynamics of this type of training, analysis of the qualitative data from the YAPEI protocols indicates that certain features of the educational process are vital to the success of school-to-work transition partnerships. Among the most critical determinants of program effectiveness are the following components: administrative support, integration of applied curriculum in school settings, implementation of a comprehensive selection process for participation, formal instruction of social skills, training in and the opportunity to use reflection, and family involvement.

Support for School-to-Work Youth Apprenticeship Programs

All school and work personnel with a direct involvement in the youth apprenticeship programs are highly committed individuals who have assisted students in working toward their academic and vocational goals. However, the students remain accountable to some school personnel in the regular education program who are not active participants in the youth apprenticeship experience. This lack of broad-based involvement of all school staff in the implementation of school-to-work issues, such as curriculum integration, applied methodology, and program requirements, contributes to students' stress. It also fosters the perception that the youth apprenticeship program is removed from the mainstream path as opposed to being a viable educational option. Moreover, system-wide administrative support for the program is presently inadequate given the importance of school-to-work as a reform initiative. School counselors also require additional training in the viability of the youth apprenticeship as a path for high quality students who presently tend to be steered away from vocational training for college preparation.

The Rochester City School District is extremely fortunate to have the support of businesses aiding in the education of young people throughout the city. The Rochester Business Education Alliance 1996-1999 proposed business plan entitled "Focus to Finish: Employers Investing in Students' Success" is an effort to involve more businesses in school-to-work collaborative activities.

Accomplishments

The youth apprenticeships provide a unique opportunity for students to engage in diverse hands-on learning experiences. The educational process provides relevant learning in an applied context. Students establish rapport with adults who model effective workplace skills, such as cooperative interaction, problem solving, vocational competence, and dedication. Moreover, the school and work personnel who are active participants in the apprenticeships are emotionally invested in the students and their success in the program.

Problems Encountered and Strategies Used to Cope With Them

The retention rate for the skilled trades program is unsatisfactory with 50% of the students withdrawing prior to completion. In order to rectify this situation the selection process is being reevaluated; however, more needs to be done to encourage middle school teachers and school counselors at the middle school and high school levels to take a proactive role in helping to identify potentially successful participants in the youth apprenticeship program.

Students' stress levels in both apprenticeship programs were reported to be extremely high. School-based and work-based personnel have been communicating with the students about their ability to cope with the high demands of the program. Time management difficulties also seemed to contribute to students' sense of being overwhelmed. Program participants recognize that these areas need further intervention.

There is a need for curriculum integration between vocational and regular education classes. To address this issue, a few regular education teachers have observed shop classes and adjusted their curriculum to coincide with topics and skills being addressed in vocational classes. More extensive training of teachers is necessary to adequately facilitate the transition between the school and work settings and overcome the perception that students are being removed from the mainstream school community..

Recommendations

The following suggestions were derived from the data and may enhance the youth apprenticeship programs in Rochester City School District:

➤ Imbed career exploration, shadowing, mentoring, and social skills development into the middle school curriculum as preparation for later involvement in work-based learning. Integrate the middle school curriculum through interdisciplinary units which emphasize making the connections between theoretical knowledge and applied skills.

➤ Involve parents to a greater degree throughout the youth apprenticeship experience. For example, beginning in the middle school years, parents should be encouraged to be active participants in their children's education by attending PTA and other school-related meetings, volunteering their services to the school, communicating with their child's teachers and/or school counselor on a regular basis regarding their child's academic development and behavior, and discussing school activities and parental expectations regarding school progress with their child. Moreover, throughout the youth apprenticeship program, parents should be invited to visit the work site and school site.

➤ For optimum success, the youth apprenticeship program must be perceived by all school staff as an integral educational experience. All faculty members should be viewed as potentially important contributors to students' success in the program, and they should be included in planning meetings where positive educational approaches for addressing school-to-work issues can be shared. This focus may prevent the marginalization of the program as an "add-on" as opposed to a viable educational option. The lack of broad-based involvement among faculty is the most significant issue requiring immediate attention.

➤ Disseminate information to all teachers (although focus should be placed upon educators with direct interaction with apprentices) to increase awareness of the programs and provide training in curriculum integration and applied methodology. Moreover, teacher orientations to the programs should clearly outline the requirements and expectations, including schedules for completion of projects and special activities. The sharing of this information may facilitate students' successful management of school and work responsibilities and provide teachers an opportunity to organize their instruction and assignment schedules to foster student success in both the school and work settings.

➤ Develop an extensive evaluation plan which includes formative and summative evaluations of students, teachers, administrators, and work site personnel. Evaluations should include the collection of qualitative and quantitative data which could be used for program enhancement.

➤ System-wide administrative support for the youth apprenticeship programs is necessary for optimum success. Especially vital is the active involvement of building principals, curriculum coordinators, and higher level administrators (i.e., superintendent). These individuals- need to be knowledgeable of the programs and committed to the allocation of resources and staff to assist with the programs.

➤ Administrative roles need to be clearly delineated to facilitate accountability at all levels of the program. An individual or individuals must be identified at the building level to collect data, monitor the program's progress, and assess the implementation of curriculum modifications (i.e., applied methodology, authentic assessment, collaborative instruction) within the classroom setting. Additionally, there must be a mechanism in place to remediate practices which are not consistent with the goals and objectives of the program.

➤ Encourage classroom teacher's implementation of instructional methodology which approximates work site expectations, responsibilities, discipline, and formality.

➤ Provide formal support services for students to address issues such as stress management, time management, affective development and functioning, conflict resolution, and interpersonal communication.

86

94

Students also may benefit from weekly group sessions (with a school counselor) to process the week's events and debrief the students. This also may provide a context in which students may participate in social skills training, role playing, and problem solving through reality based simulations.

➤ Orientate all participants, including mentors, job coaches, teachers, and coordinators regarding the philosophy of the Youth Apprenticeship Programs, the goals, and desired outcomes. The school and job personnel who participate in the program should serve as advocates for the youth apprentice experience.

➤ Implement active recruitment of qualified students for participation in the apprenticeship programs. Clarify the ideal student profile and devise procedures to attract these students (i.e., advertise the program in the school, organize informational meetings for interested students, elicit teacher input regarding appropriate candidates). Moreover, concerted efforts to recruit students into apprenticeship programs lacking equitable gender representation should be undertaken. For example, more male students may be recruited into health care experiences and more females may be enlisted for the skilled trades program.

➤ Examine the type, scope, and sequence of courses offered for students who are potential candidates for the programs. For example, are the courses meeting the needs of the apprentices, and are the students taking the courses at the right time to provide sufficient background for performing their responsibilities at work. This examination may take the form of a curriculum audit.

➤ Minimize additional external stressors for the apprentices by scheduling media or other extracurricular events around their academic responsibilities and/or encourage teachers' flexibility and support in responding to the needs of the students.

➤ Provide students with vacation time from work.

➤ Establish a stronger relationship with higher education to facilitate the collection and analysis of data, the development of inservices, and the identification of best practices.

➤ School personnel may want to examine literature on school restructuring to help identify those behaviors or practices critical to educational improvement.

➤ Devise a public relations and student reward system which recognizes student success in the apprenticeship programs. This may take the form of a banquet or the awarding of a school letter for academic success.

➤ In order to maximize the usefulness of the data collected on the youth apprenticeship programs, it is highly recommended that all involved participants be invited to engage in a facilitated forum to reflect on the program's progress and problem solve solutions to barriers to successful implementation.

Future Research Directions

Since this is a pilot study, the researchers plan to refine the YAPEI protocol. Furthermore, expanded study in social skills development and application in youth apprenticeship programs needs to be explored in greater depth. Examination of the characteristics of effective schools which foster the growth and development of youth apprenticeship programs also is necessary. This information is being gathered and will be analyzed in the future. Individuals interested in these subtopics are encouraged to contact the authors.

References

Finch, C. R. (1992). *Using professional development to facilitate vocational and academic education integration: A practitioner's guide.* (ERIC Document Reproduction Service No. ED 352 456)

Grubb, W. N. (Ed.) (1995). *Education through occupations in American high schools (Vol. 1): Approaches to integrating academic and vocational education.* New York: Teachers College.

Grubb, W. N. (Ed.) (1995). *Education through occupations in American high schools (Vol. 2): The challenges of implementing curriculum integration.* New York: Teachers College.

Kincheloe, J. L. (1995). *Toil and trouble: Good work, smart workers, and the integration of academic and vocational education.* New York: Peter Lang.

Newmann, F. M., & Wehlage, G. G. (1995). *Successful school restructuring: A report to the public and educators by the Center on Organization and Restructuring of Schools.* Madison, WI: Board of Regents of the University of Wisconsin System.

Youth Apprentice Program Evaluation Instrument
(YAPEI)

Participant's Name _____
Date of Birth _____
Address_____

            _____
            _____

Phone _____
Date _____

Part I Profile of Participants

I. Profile of Students: Demographic Information
    A. Gender
        1. Female _____
        2. Male _____

    B. Ethnicity
    1. African American _____
    2. Alaskan Native _____
    3. American Indian _____
    4. Asian American _____
    5. Caucasian _____
    6. Chicano/Mexican American _____
    7. Cuban-American _____
    8. Puerto Rican _____
    9. Other Hispanic _____
    10. Other (Please specify) _____

    C. Country of Birth
        1. United States _____
        2. Other (Please specify) _____

    D. Bilingual and Special Needs Enrollment
        1. Classified as Bilingual Student _____
        2. Classified as Student with Special Needs (Please indicate category of
            special need.) _____

II. Profile of Students: Education Information
    A. Academic performance prior to entering the youth apprenticeship program.
    1. Overall G.P.A. of Youth Apprenticeship Participant _____
    2. Core Courses G.P.A. of Youth Apprenticeship Participant _____
        a. Mathematics: Course _____ Grade _____
        b. Science: Course _____ Grade _____
        c. English: Course _____ Grade _____
        d. Social Studies: Course _____ Grade ____

B. Academic performance at the conclusion of the youth apprenticeship program.
1. Overall G.P.A. of Youth Apprenticeship Participant _____
2. Core Courses G.P.A. of Youth Apprenticeship Participant _____
   a. Mathematics: Course _____ Grade _____
   b. Science: Course _____ Grade _____
   c. English: Course _____ Grade _____
   d. Social Studies: Course _____ Grade _____

C. Attendance Rate

   1. Percentage of days in attendance at the high school during the school year
       prior to entering the youth apprenticeship program _____
   2. Percentage of days in attendance during the school year in which the youth
       apprenticeship program was completed _____

D. Standardized Tests/Results/Grade Level at Time of Test

   _____ _____   _____
   _____ _____   _____
   _____ _____   _____
   _____ _____   _____

E. Retention

1. Have you ever been retained in school? If so, for which grade(s)? _____

III. Profile of Students: Career Information
   A. Prior to entrance into the Youth Apprenticeship Program, had you seriously
       considered this area as a career option? _____

   B. Following completion of the Youth Apprenticeship Program, are you
       considering a career in this area? _____

   C. If answers for A and B are not the same, please explain this discrepancy.
       _____
       _____

   D. Have you ever been employed prior to working in the Youth Apprenticeship
       Program? If so, please indicate your previous position and how much you
       were paid per hour.
       _____
       _____

90

98

IV. Profile of Students: Family Background
   A. Indicate the educational level achieved by your parents. Mark M for mother
      and F father in the spaces below.
         1. Did not finish High School _____
         2. High School Only _____
         3. Post High School Vocational or Business Program _____
         4. Some College _____
         5. Associates Degree _____
         6. Finished Four Year College Degree _____
         7. Graduate Degree _____

   B. Household Composition
         1. Living with Both Parents _____
         2. Living with one parent and no other adult _____
         3. Living with one parent and other adults(s) _____
         4. Living with two adults other than parents _____
         5. Living with one adult other than parent _____
         6. Not living with any adult _____

   C. Socioeconomic Status--Household Income
         1. Under $10,000   _____
         2. $10,000-$14,999   _____
         3. $15,000-$19,999   _____
         4. $20,000-$24,999   _____
         5. $25,000-$34.999   _____
         6. $35,000-$49,999   _____
         7. $50,000 and over   _____

   D. Number of adults in household working for pay at time of survey
         1. No adults working _____
         2. One adult working _____
         3. Two or more adults working _____

E. For each of your siblings, please complete the information on the chart below.

Male/Female	Age	Highest Grade Completed	Participated in Youth Apprenticeship Program (Yes/No)	Current Occupation

91

Part II Program Perspectives

Directions:
Answer the following questions to the best of your ability. As you complete each question try to include specific, personal examples where applicable.

1. What do you perceive were the strengths of the youth apprenticeship program?

2. What do you perceive were the weaknesses of the youth apprenticeship program?

3. Were you paid for your work in the youth apprenticeship program?

Yes _____   No _____

If you answered yes, how much were you paid per hour? _____

Would you have selected this youth apprenticeship program if it did not involve a paid position? Yes _____   No _____

4. How has the youth apprenticeship program prepared you for post-high school employment?

5. What strategies have you implemented to fulfill your responsibilities at work and achieve success in school?

6. How has the high school created a learning environment which encourages your
    a) personal growth

    b) academic success

    c) work-related success

7. How has the work site created a learning environment which encourages your
    a) personal growth

    b) academic success

    c) work-related success

8.   If you were on the selection team interviewing potential students for participation in the Youth Apprenticeship Program, what qualities/skills would you look for when choosing students?

92

9. Please rate each of the following skills on a scale from 1-3 as to how important you feel they are for success in the youth apprenticeship program.

	not very important	somewhat important	extremely important
Accepts criticism from supervisor	1	2	3
Is honest	1	2	3
Works cooperatively on a team	1	2	3
Follows instructions/directions	1	2	3
Asks for help and explanations	1	2	3
Works independently	1	2	3
Is responsible and dependable	1	2	3
Gets along well with others	1	2	3
Is interested & willing to learn new things about the job	1	2	3
Works well with supervision	1	2	3
Can negotiate & convince others	1	2	3

Part III One Year Follow-Up

Directions:

This section is to be completed at the one-year follow-up. Answer the following questions to the best of your ability. As you complete each question try to include specific, personal examples where applicable.

Date Completed _____

1. Since you graduated from the Youth Apprenticeship Program, describe your occupational/educational history.

2. Indicate the title of your current position and salary.

3. How satisfied are you with your current position?

4. Reflecting back to your experiences in the Youth Apprenticeship, how do you perceive that the program benefited you?

93

Part IV Five Year Follow-Up
Directions:

This section is to be completed at the five-year follow-up. Answer the following questions to the best of your ability. As you complete each question try to include specific, personal examples where applicable.

Date Completed _____

1.   Since you graduated from the Youth Apprenticeship Program, describe your occupational/educational history.

2.   Indicate the title of your current position and salary.

3.   How satisfied are you with your current position?

4.   Reflecting back to your experiences in the Youth Apprenticeship, how do you perceive that the program benefited you?

A Comparison of Students' Achievement in Applied Mathematics for TECH PREP and Algebra I

C. Kenneth Tanner
The University of Georgia
Athens, GA

and

Patricia J. R. Chism
Stephens County High School
Toccoa, GA

Abstract

Student achievement was measured in two programs of mathematics offered in seven high schools. A sample of 224 students was compared on results of the SAT-M. Students' scores on Iowa Test of Basic Skills served as the covariant. One group of students were in the traditional "Algebra I" curriculum. The second group (Tech Prep) was in its second year of "Applied Mathematics." Students in the TECH PREP program made significantly higher scores on the SAT-M. We recommend the continuation the two-year "Applied Mathematics" program as a substitute for "Algebra I" based on the findings in this study.

Introduction to the Problem

"Applied Mathematics" is a two-year program for teaching mathematics to high school and vocational school students using a laboratory approach that relates mathematics skills to real-life problems. The "Applied Mathematics" program now can be substituted for one year of algebra in Georgia Public Schools. The question arises whether students taking "Applied Mathematics" are learning the content and skills that are equivalent to a one-year algebra course.

Background

States have examined and changed graduation requirements over the last ten years in an effort to produce a graduating student population with higher achievement levels and better work related skills. The most common change states have made in graduation requirements is an increase in the required number of academic courses, especially mathematics and science. This increase in academic requirements has led to new curriculum offerings.

"Applied Mathematics" is one new curriculum offered by vocational educators to provide students more content and skills in mathematics. Vocational leaders have responded to the concern of the business community and its need for graduates who are better prepared academically. Media across the country have reported a need for more technically educated workers. As Miller and

White reported in the <u>St. Petersburg Times</u> (1993),". . . those who enter the work force with a high school diploma aren't likely to earn much more than minimum wage" (p. 3). The "Applied Mathematics" program claims to meet the need for additional mathematics skills for students by giving them a hands-on, problem-solving approach to the mathematics needed in a technically advanced environment.

Mathematics' Importance in the 90s

The launching of Sputnik in 1957 created an awareness in America that mathematics and science skills were essential in order for the United States to survive. Many steps were taken to bolster the teaching of mathematics and science in public schools. Even though there was a continued emphasis on mathematics and science during the Saturn space program, America's students as a whole were still falling behind in these subjects. In 1983, when <u>A Nation at Risk</u> (National Commission on Excellence in Education, 1983) was released, Americans were again made aware of the fact that these important mathematics and science skills were not being mastered by the students in our schools.

<u>A Nation at Risk</u> recommended that high school graduation requirements be increased to include at least three years of mathematics. Many schools have complied, but what are the outcomes? Wilson and Rossman (1993 reported that even though students are now being required to take more academic courses that include more mathematics, these courses are lower level courses. More students are earning more mathematics credit, but the credit is for remedial or lower level mathematics courses.

This increase in academic course requirements and more rigorous curricula, along with concerns from employers in the business world, have led vocational educators to look carefully at the focus of their programs. Vocational courses usually earn elective credits, not academic credits. Copa and Johnson (1988) concluded that states should examine vocational course content closely and find out if the course covers basic content comparable to an academic credit course. If it does, academic credit is appropriate.

Glimm (1991) proposed that more emphasis should be put on mathematics as it relates to careers because of the direct connection to economic competitiveness. He indicates that mathematics is useful across the entire product cycle, contributing to making better products, improving quality, and shortening the design cycle.

The National Commission on Excellence in Education (1983) stated that students completing high school mathematics should be able to understand geometric and algebraic concepts, apply mathematics in everyday situations, and estimate, approximate, measure, and test the accuracy of their calculations. The report recommended that even students not planning to continue into higher education should have these basic mathematics skills (1983).

Finch and Crunkilton (1985) suggested in their article, "Is Your Curriculum Ready for the Nineties?," that schools must provide students with the opportunities to integrate technical skills with a range of other skills such as communications, human relations and computations. The National Council of Teachers of Mathematics has written standards for reforming the mathematics curricula in our schools. Frye (1991) reported on these standards and the major shifts in mathematics instruction. According to Frye (1991), the Professional Standards for Teaching Mathematics include recommendations to teach mathematical reasoning and logic instead of just procedures. The teacher is the key to changing the way in which mathematics is taught by creating a student-centered learning environment (Frye, 1991).

96

"Applied Mathematics" is a two-year curriculum developed by The Center for Occupational Research and Development (CORD) for a consortium of state vocational education agencies. The development of the program was the result of vocational state agencies' concerns that vocational education was not emphasizing basic academic skills necessary in the workplace (Bernstein, 1992; Oswald, 1986). The National Council of Teachers of Mathematics and the Tech Prep/Applied Academics movement share common goals. Kepner (1993) reports these common goals include developing students who are proficient in mathematical problem solving, and producing students who are confident in the mathematics needed in a variety of situations. Willard Daggett (1993) reported that the applied courses successfully integrate vocational and academic education and answer the need for educational reform in our schools. "The 'Applied Mathematics' is designed for the middle 50% of the school population. The curriculum emphasizes the practical applications of academic mathematical skills and problem solving skills" (Mizer, 1990, p. 48).

The "Applied Mathematics" literature (Center for Occupational Research and Development, 1988) describes the program as "a set of modular learning materials prepared to help high school vocational students and others develop and refine job-related skills" (p. T-l). The course "focuses on arithmetic operations, problem-solving techniques, estimation of answers, measurement skills, geometry, data handling, simple statistics, and the use of algebraic formulas to solve problems" (1988, p. T-1). Although the material contains traditional mathematics content, the program is designed to develop mathematics skills used in work-related problem solving. CORD (1988) claimed the material is appropriate for academic credit or can be included in vocational course work as it is needed. CORD (1988) also states the material is written at an eighth grade reading level and is specifically appropriate for students anxious about mathematics. It is suggested by CORD (1988) that the materials be used with students with eighth grade pre-algebra skills, which include students from ninth through twelfth grades and adults in vocational and technical schools.

An important goal of 'Applied Mathematics' is to provide completers of this two-year sequence with skills equal to or greater than those of students completing a first-year algebra course. The program consists of 36 units offered over a two-year period. Each unit is made up of a video, laboratory activities, problems for basic drill, and 30 to 40 problem-solving exercises as word problems. The program claims to help students understand mathematics in a technical world and to reduce mathematics anxiety.

The Georgia Department of Education has accepted "Applied Mathematics 1 and 2" as fulfilling two years of the required three years of mathematics credit needed for a high school diploma. One year of mathematics credit must be algebra or an algebra equivalent. The completion of both "Applied Mathematics 1 and 2" is accepted by the state department as an algebra equivalent for a general high school diploma. It is not accepted as college preparatory credit for a college preparatory seal at this time.

The Quality Core Curriculum for the state of Georgia (Johnson, 1988) describes the "Algebra I" curriculum for grades 9 through 12 as the beginning course in the high school college preparatory sequence for mathematics for most students. As a gateway course, Algebra I provides students with the tools to deal with quantitative aspects of their environment. Throughout this course, algebraic concepts and skills must be applied to solving problems. Problem solving must involve selecting appropriate approaches and tools such as calculators and computers, estimating and judging the reasonableness of results, and relating concepts to each other and appropriate real-world applications.

State-approved algebra textbooks and objectives follow a traditional approach to teaching mathematics content. The course emphasis is on mathematics content. The "Applied

97

Mathematics" program emphasizes a laboratory approach to teaching mathematics content, and objectives are based on the student's mathematics needs for future use.

Georgia's Technology Preparatory Consortium recommends that "Applied Mathematics" courses should not only receive academic credit, but are appropriate courses to receive college preparatory credit (1993). CORD (1993) claimed that students who completed the two-year "Applied Mathematics" program have obtained skills equal to or greater than students who have completed first year algebra.

Several states using the "Applied Mathematics" curriculum have done studies to verify the program's success. The Oklahoma State Department of Vocational and Technical Education (1990) found that applied academic skills give students more success, and that teachers learn to communicate with each other, students, and administrators.

The Pennsylvania State Department of Education found the following: teachers perceived "Applied Mathematics" as an excellent connection between work and school, the video programs stimulated excellent discussion activities, mathematics scores improved, academic and vocational collaboration were enhanced, teacher and student attitudes toward mathematics were more positive, and students felt the materials were important and interesting (Bernstein, 1992). Teachers perceived several disadvantages of the program:

1-   extra planning time was needed to implement materials
2-   the reading level was of some concern to teachers,
3-   admission to higher education programs was not always possible with the "Applied Mathematics" credit (Bernstein, 1992).

The Pennsylvania teachers suggested students receive academic credit for applied curricula.

An evaluation of the "Applied Mathematics" programs in Indiana found that the "Applied Mathematics" programs "enabled students to perform at higher academic levels across a broader range of proficiency areas in mathematics than the traditional materials being used in comparison classes" (Pepple & O'Connor, 1992). Pepple and O'Connor (1992) found that students in the program better understood the mathematics skills needed in the workplace, and they felt mathematics skills were important to their future job success.

Bernstein (1992) sees CORD's "Applied Mathematics" program as one way to integrate vocational and academic skills to improve the academic and work-related effectiveness in students. CORD (1993) claimed the program offers students a two-year curriculum to learn mathematics skills that they would normally fail to learn, and they will also be prepared to enter higher level mathematics courses if they desire. Driscoll and Confrey (1985) reported in an article about "Applied Mathematics," that "one of the biggest ego boosts for the vocational students who have not done well in traditional courses is to realize after the first test that they can compete with the students who have done well in the traditional courses and often outperform them" (p. 129).

Conceptual Framework

The "National Goals for Education," a joint statement made by the President and the Governors of the United States on February 26, 1990, called for United States students to be the first in the world in science and mathematics by the year 2000. Georgia lawmakers addressed these national goals by increasing the mathematics and science units required to graduate in their state. Georgia graduation requirements state that one of the three mathematics units be algebra or its equivalent. New mathematics curricula have resulted from the need to offer more mathematics. "Applied Mathematics 1 and 2" and "Fundamentals of Algebra" have now been added to course offerings in the state of Georgia and accepted as algebra equivalents. The fundamentals of algebra

98

course was offered for the first time in a few Georgia high schools beginning in the fall of 1993. The "Applied Mathematics" courses have been offered in high schools across Georgia for several years.

Preparing students for mathematics they need to maintain needed job skills is the main goal of the "Applied Mathematics" program. The National Goals for Education stated the need for United States students to be prepared to think and become responsible citizens and productive workers in a modern economy (1990). Lotto (1988) in summarizing the Carl D. Perkins Vocational and Applied Technology Act of 1990 indicates that vocational education needs to emphasize basic academic skills. "Applied Mathematics" is a mathematics curriculum developed by the Center for Occupational Research and Development (CORD), a nonprofit public service organization, for the purpose of offering more academic skills to the vocational student.

The Georgia Technology Preparatory Consortium's, a group created to help implement technology preparatory programs in Georgia, goal is to offer college preparatory credit for the applied courses. The consortium stated in its 1993 position paper that these courses should be considered for college preparatory credits "as long as courses meet the same rigorous requirements and objectives" (p.2). CORD has collected data from four states using an algebra exit exam with "Applied Mathematics 2" students and first year algebra students. "The results of the algebra exit exam show that . . . completers of 'Applied Mathematics 1 and 2' have developed generally the background necessary to take higher level courses in mathematics" (1992, p. 2).

A common measure of mathematics achievement and readiness for college mathematics is the Scholastic Aptitude Test (SAT). The SAT is the most widely used college entrance exam in our nation. Several studies show a relationship between the type and level of course work and SAT performance (Sebring, 1985; Goertz, 1989; Morgan, 1989). The Scholastic Aptitude Test (SAT) is given to high school students nationwide and is used extensively by colleges in making college entrance decisions. The SAT has also been used heavily in studies relating to achievement, ability, and predicted success. Sebring (1985) and Morgan (1989) both used the SAT to find that the amount and level of course work resulted in higher SAT scores. Morgan (1989) found the relationship was particularly relevant between mathematics course work and the SAT mathematics test score. The SAT was used in Gougeon's study (1985) to find a valid predictor of students' overall achievement in college mathematics. Gougeon (1985) states that the most valid predictor of students' overall achievement in college mathematics is their high school mathematics average and the student's SAT-M test score. SAT-M scores need to be analyzed for the students receiving algebra credit and/or college preparatory credit in the "Applied Mathematics" program.

Purpose

The purpose of this study was to compare mathematics achievement of students who completed "Applied Mathematics 1 and 2" with mathematics achievement of students who completed one year of "Algebra I". One major question guided the study.

Research Question

This study focused on the following question: Is there a statistically significant difference between mean scores on the Scholastic Aptitude Test Mathematics section (SAT-M) for students who have completed "Applied Mathematics 1 and 2" and students who have completed "Algebra I"?

Basis of the Study

High School administrators need to know if the content taught in the two "Applied Mathematics" courses prepares students for higher level mathematics courses for the following reasons:

1. The implementation of an "Applied Mathematics" program into the curriculum will require more money for materials, teacher training, mathematics laboratory, and smaller class size for laboratory situations.
2. Starting an "Applied Mathematics" program will require time spent in planning, teacher training, and organization of curriculum.
3. The "Applied Mathematics" program would give some students two years to learn the skills needed for second year algebra.
4. Students would be able to receive college preparatory credit toward a college preparatory seal.

Assumptions

The following assumptions were made in conducting this study:

1. SAT-M appropriately measures achievement in "Applied Mathematics 1, 2" and "Algebra I."
2. Students answered the SAT-M in a serious manner.
3. Students' data were representative of the population.

Constraints

The constraints for this study that might have an effect on the results were:

1. Not all high schools in Georgia offer two years of "Applied Mathematics."
2. Teachers have different teaching styles and personalities.
3. Classroom physical setting will vary greatly throughout Georgia high schools.
4. The sequencing of mathematics courses are not the same in all Georgia high schools.

Method

Given that the purpose of this study, the following null hypothesis was proposed:

Null Hypothesis

Ho:1. There will be no statistically significant difference between the mean scores on the Scholastic Aptitude Test Mathematics section (SAT-M) for students who have completed "Applied Mathematics 1 and 2" and for students who have completed one year of algebra.

Population

The population consisted of students in 30 Georgia high schools that offered "Applied Mathematics 1 and 2" and "Algebra I." This included various sizes of high schools throughout the state of Georgia. The "Applied Mathematics" students were tested in the spring of their second year of applied mathematics. Algebra students were tested in the spring of their first year of algebra. Students from all levels of the socio-economic strata were represented. Both males and females from varied racial backgrounds were included in the study.

Sample

A total of 30 high schools from Georgia that had students who had completed "Applied Mathematics 1 and 2" were asked to participate in the study. Eleven high schools agreed to participate in the study. Seven high schools returned data. One hundred twenty-two students completing their first year in algebra made up one group of the study. One hundred two students completing the "Applied Mathematics 2" course made up the other group in the study.

SAT

The mathematics score from one section of a retired Scholastic Aptitude Test (SAT) was used to compare the mathematics achievement of the two groups. The test contained 25 mathematics problems and took 30 minutes to complete. Buros (1972) reported that the SAT is used as an aid for colleges to assess students' potential to succeed in college. It is the most widely used test for college entrance. There are 60 items on the complete SAT-M. The two mathematics sections take a total of 75 minutes to complete. There is an arithmetic reasoning section along with a substantial amount of algebra and geometry. Buros (1972) reported the internal consistency reliability coefficient as .90 for the SAT-M. Validity coefficients between the SAT and college graduates are "as high as have been attained with any general testing instrument in comparable settings" (Buros, 1972, p. 649).

Data Collection Procedures

Two sets of data were needed for each participant. Data for first year algebra students were placed in one group, while data on the "Applied Mathematics 2" students were placed in another group. Each student's eighth grade Iowa Test of Basic Skills mathematics total score was recorded.

A practice SAT-M was given to each student to get the SAT-M score. The classroom teacher administered the SAT-M practice test to participating students in each school during two 30 minute periods arranged by the school. Cases that did not have all three test scores available were not included in the study.

Statistical Analysis Procedure

An analysis of covariance with the SAT-M as the dependent variable was used to compare the achievement in mathematics for the "Applied Mathematics" group and the algebra group. The eighth grade Iowa Test of Basic Skills (ITBS) was used as the covariate to adjust the SAT-M scores to account for each student's mathematics achievement before high school. There was slightly more concern that a Type I error would be made and a true null hypothesis would be

101

rejected. A .01 level of significance was chosen for the analysis between the mathematics achievement of the two groups. Time and money invested in a program with no significant difference in achievement could be a wasted effort. Table 1 summarizes the statistical analyses used in the study.

Profile of the Participants

This study included 224 students from 7 high schools throughout Georgia. There were 102 students in the "Applied Mathematics" group and 122 students in the first year algebra course. As summarized in Table 2, the "Applied Mathematics" group was made up of 53 males and 49 females. This group was made up of Caucasian (83%), Black (15%), and other races (2%). The majority of "Applied Mathematics" students were between 16 and 18 years old. A total of 39 students was 17 years old. There were no 14-year-olds in this group and only three 15-year-olds. This group included eight 19-year-olds and one 20-year-old. Sixteen students were in the tenth grade, 53 were in the eleventh grade, and 33 were in the twelfth grade.

The algebra group was made up of 51 males and 71 females. This group included Caucasian (76%), Black (19%), and other (less than 5%). The majority of algebra students were between 14 and 16 years with 51 of the total number being 15 years old. There were 6 students in the algebra group that were 18 years old. No students were over age 18. Sixty of the algebra students were in the ninth grade, 46 in the tenth grade, 10 in the eleventh grade, and 6 in the twelfth grade.

Table 1
Statistical Analyses

Hypothesis	Independent Variable	Dependent Variable	Analysis	Alpha
Ho: 1	Math groups - Applied Algebra I	Achievement SAT-Math	ANCOVA*	.01

*The covariate was students' eighth grade ITBS mathematics score

Data and Analysis for the Null Hypothesis

This hypothesis was tested through a one-factor analysis of covariance (ANCOVA). The students' eighth grade ITBS mathematics total scores were used as the covariate to statistically control for initial differences in mathematics levels among the two groups. If the two groups showed a significant difference in SAT-M scores, the two programs needed to be analyzed to determine what the differences were in mathematics skills and why the differences occurred. If the two groups showed no statistically significant difference in SAT-M scores, then it could be concluded that both groups would be at the same level in mathematics as measured by the SAT-M

Results of the ANCOVA are shown in Table 3. The F-Value for the two treatment groups ("Applied Mathematics" and algebra) was 10.670 which is statistically significant at the .01 level of significance (p = .0013). The SAT-M score means were adjusted by the ITBS score. The adjusted SAT-M scores were significantly different after they were exposed to the two different mathematics programs.

102

The low p-value for the ITBS scores as shown in the ANCOVA (p = .0001) indicates the two groups were significantly different in mathematics levels or abilities before they were exposed to the two mathematics curriculums. The scores were correlated with the SAT-M. The ITBS score as a covariate was useful in controlling for pre-existing differences in the two groups.

The F-Value for the interaction between the mathematics groups and the ITBS score was 11.575 (p < .01). This indicates there is a statistically significant interaction between the ITBS and the SAT-M scores of the two mathematics groups. High ITBS scores do not directly relate to high SAT-M scores nor do low scores predict low results. The null hypothesis was rejected.

An adjusted mean was computed to estimate the mean SAT-M score for each mathematics group. Table 4 reveals the means and the adjusted means for the two groups. The adjusted mean was used because the two treatment groups were of different sizes, and the beginning mathematics levels were different. To give equal weight on the SAT-M for the two groups, the Least Squares Means (LSMs) was computed, which is a mathematically adjusted mean. The "Applied Mathematics" group showed a higher LSMs than the algebra group (Applied LSMs = 10.322, Algebra LSMs = 8.730).

Conclusions

The null hypothesis that guided the comparisons of the means on the SAT-M for the "Applied Mathematics" group and the algebra group, as adjusted by the eighth grade ITBS, was rejected. The "Applied Mathematics" group had a significantly higher LSMs indicating they made significantly more progress than the algebra group.

The "Applied Mathematics" group scored significantly higher on the SAT-M after scores were adjusted by the ITBS. These findings support the results of the studies done by CORD (1992, 1993) in which it was concluded that "Applied Mathematics" students did as well as, if not better than, first-year algebra students on an algebra exit exam.

"Applied Mathematics" is now accepted as an equivalent course to the first year of algebra by the State of Georgia. Vocational educators in Georgia (1993) and CORD (1992, 1993) have stated that "Applied Mathematics" students are ready for higher level mathematics including the second year of algebra and/or college level algebra. These educators are requesting that students completing the "Applied Mathematics" two-year curriculum should be given college preparatory credit and encouraged to continue in higher level mathematics courses.

These findings must be accepted with discretion. The "Applied Mathematics" group was older and in higher grade levels than the algebra group. The gains could possibly be attributed to the group's maturity and experiences. The "Applied Mathematics" group did have two years to complete the mathematics program that included problem-solving and algebra skills. We cannot say that the "Applied Mathematics" program is better and should replace a traditional algebra program offered to ninth and tenth graders. The clear inference is that the "Applied Mathematics" program may serve a purpose for those students that are not as proficient in mathematics. The program is designed for the middle 50% of students with an emphasis on practical applications of mathematics skills and problem-solving skills. The two-year, problem-solving intense curriculum can assist students in making considerable gains in mathematics abilities.

Table 2
Data Frequency Summary

Variable	"Applied Mathematics"		Algebra	
	Frequency	Percent	Frequency	Percent
Males	53	52%	51	42%
Females	49	48%	71	58%
Total	102	100%	Total	100%
Grade				
9	0	0%	60	49%
10	16	16%	46	38%
11	53	52%	10	8%
12	33	32%	6	5%
Age				
14	0	0%	25	20%
15	3	2%	51	42%
16	22	22%	30	25%
17	39	38%	10	8%
18	29	28%	6	5%
19	8	8%	0	0%
20	1	1%	0	0%
Race				
Caucasian	85	83%	93	76%
Black	15	15%	23	19%
Other	2	2%	6	5%

104

Table 3
One-Factor Analysis of Covariance for SAT-M

Source	df	SS	MS	F	p
Treatment Applied/ Algebra	1	107.429	107.429	10.670	.0013
ITBS	1	150.171	150.171	14.915	.0001
Treatment X ITBS	1	116.541	116.541	11.575	.0008
Residual	220	2215.034	10.068		

Table 4
Means Table for the Two Groups

Groups	Count	ITBS Mean (Std Dev)	SAT-M Mean (Std Dev)	Adjusted Mean (Std Dev)
Applied	102	161.676 (15.512)	8.775 (.329)	10.322 (5.197)
Algebra	122	198.443 (46.430)	8.811 (3.212)	8.730 (3.375)

Recommendations

This study shows that "Applied Mathematics" students do as well and sometimes better than Algebra I students on measures of achievement in mathematics. The students in the "Applied Mathematics" program are older and have been given the chance to mature in their level of thinking. They have two years in a "hands-on" laboratory approach to master the content. These students do make significant progress in their mathematics ability. "Applied Mathematics" students need to be encouraged to continue in higher level mathematics. Future studies might include the following:

1. Analysis of the type, age, and maturity level of student that has the most success in the program.
2. A follow-up study of "Applied Mathematics" students after they complete the program and continue in higher level mathematics courses.
3. A study that controls for teacher differences.

Therefore, it is recommended that administrators and mathematics teachers continue offering the "Applied Mathematics" curriculum. The program appears to be meeting the need for

105

the middle fifty percent of students that previously did not take higher level mathematics courses. It is also meeting a need for those students that need a different approach to mathematics content by offering the real-life, problem-solving approach. Educators are constantly reminded by employers and colleges that today's high school graduates need more advanced technical skills that include higher level mathematics skills and understanding. Employers and higher learning institutions seem to feel that today's students do not have these needed skills. Students are succeeding in this program on achievement measures; these students may not have had the opportunity to succeed in a traditional mathematics program. This ability to succeed in the program offers a reason for continuing and increasing the program in Georgia high schools.

References

Bernstein, P. (1992). *Math without fear. A concrete approach to mathematics.* Philadelphia, PA: Pennsylvania State Department of Education.

Buros, O. D. (Ed.) (1972). *The seventh mental measurements yearbook* (7 ed.). Highland Park: Gryphon Press.

Center for Occupational Research and Development. (1988). *"Applied mathematics," teacher's manual.* Waco, Texas: Applied Mathematics Project Staff.

Center for Occupational Research and Development. (1992). *A report on the attainment of algebra 1 skills by completers of "applied mathematics 1, 2".* Waco, Texas: CORD Project Staff.

Center for Occupational Research and Development. (1993). *Report on the attainment of algebra 1 skills by completers of "Applied Mathematics 1 & 2".* Waco, Texas: CORD Project Staff.

Copa, G. H., & Johnson, M. A. (1988). *Vocational education and high school graduation requirements.* Minnesota University. (ERIC Document Reproduction Service No. ED 301656).

Daggett, W. R. (1993). Answering the call for school reform. *Balance Sheet, 74,* 2-3.

Finch, C. R., & Crunkilton, J. R. (1985). Is your curriculum ready for the nineties? *Vocational Education Journal, 60*(2), 31-32.

Frye, S. M. (1991). *Communicating the next message of reform through the professional standards for teaching mathematics* (Report No. EDO-SE-91-6). Washington, DC. (ERIC Document Reproduction Service No. ED 335238).

Georgia Technology preparatory Consortium. (1993). *Education position paper* (position paper) Atlanta, Georgia.

Glimm, J. G. (Ed.). (1991). *Mathematical sciences, technology, and economic competitiveness.* Washington, D.C.: National Academy Press.

Goertz, M. E. (1989). *Course-taking patterns in the 1980s* (Research Report Series No. RR-013). Center for Policy Research in Education.

Gougeon, D. J. (1985). *The declining years of nationally-norm tests (1964-1981).* (ERIC Document Reproduction Service No. ED 292852).

Johnson, W. P. (Ed.). (1988). *Georgia Department of Education Quality Core Curriculum.* Atlanta: Office of Instructional Programs.

Kepner, H. S. Jr. (1993). Mathematics--an integration of views. *Balance Sheet, 74,* 19-21.

Lotto, L. S. (1988). What about vocational education: A review of the evidence. *Educational Policy, 2*(3), 265-85.

Miller, M., & White P. (1993, August 17). A program means options for learning new job skills. *St. Petersburg Times,* p. 3.

Mizer, R. (1990). *Mathematics: Promising and Exemplary programs and materials in elementary and secondary schools.* Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 335230).

Morgan, R. (1989). *An examination of the relationships of academic coursework with admissions test performance* (Statistical data-report No. ETS-RR-89-38). College Entrance Examination Board.

The National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform.* Washington D. C.: United States Department of Education.

The National Goals for Education. (February 26, 1990). Joint statement by the President and the Governors of the United States of America.

Oklahoma State Department of Vocational and Technical Education. (1990). *The impact of applied academic skills in vocational and nonvocational classrooms as seen by teachers: A focus group study.* Stillwater, Oklahoma: (Eric Document Reproduction Service No. ED 324511).

Oswald, M. (1986). A math course students can use. *Vocational Education Journal, 61 (May 1986),* 42-44.

Pepple, J., & O'Connor, F. (1992). *An evaluation of the "Applied Mathematics" and applied communication demonstration sites in Indiana.* Wabash Valley Vocational Cooperative. (Eric Document Reproduction Service No. ED 347316).

Sebring, P. A. (1985). Raising high school graduation requirements: A look at the assumption and the evidence. *Joint Annual Meeting of the Evaluation Network and the Evaluation Research Society,* (pp. 27). Toronto, Canada.

Wilson, B. L., & Rossman, B. B. (1993). *Managing academic excellence.* New York: Teachers College Press.

107

Student Performance After Instruction in Applied Mathematics

Malcolm G. Keif
Central Missouri State University

and

Bob R. Stewart
University of Missouri

Introduction

Instruction in applied academic courses, including mathematics, has received increased attention as a part of Tech Prep initiatives as well as other efforts to restructure the delivery of education in our schools. The SCANS (1991) report, Goals 2000, School-to-Work Opportunities Act, and Tech prep, Title III of the Perkins Vocational and Applied Education Act all suggested the need to restructure education to better develop the skills needed to enter the increasingly complex work place. Students must not only understand basic concepts but how to apply them to real world problems (Marshall and Tucker, 1992). Recent work in cognitive psychology about how people learn has also suggested the need to explore alternate approaches to facilitate student learning (Resnick and Klopfer, 1989).

The Tech Prep initiative has encouraged curriculum reform including the teaching of applied academic courses. This is consistent with the three foundational principles that Hull and Parnell (1992) identified for Tech Prep. The related principle stated that students will learn better when courses are taught in a real-world context. Under Title III of the Perkins Act, Tech Prep must, among other things, build student competence in mathematics, science, and communications through a sequential course of study; and lead to employment placement (Brustein, 1993).

In a national study of the evaluation of Tech Prep activities, Custer, Ruhland, and Stewart (1995) found that "a major thrust of Tech Prep has to do with developing and implementing processes for restructuring schools and instituting fundamental changes in the way that education is delivered in America. This is related to national as well as local initiatives, such as the association with the broader range of educational reform that is occurring across the nation" (p. 14).

The applied mathematics approach differs from traditional math courses. The curriculum is structured to present concepts in context to real-life events. Activities that bring abstract ideas into concrete, hands-on activities are foundational. Applied course activities are designed to reflect a psychological framework of associative learning and learning style preferences. Balsam (1985) stated that, "Learning occurs in a cognitive or associative context of what has been learned before and in an environmental context that is defined by the location, time, and specific features of the task at hand" (p. 1). Context improves the learning process by allowing relationships to be drawn among associated components.

Several early psychologists emphasized the importance of association in learning (Guthrie, 1935; Hull, 1943; Thorndike, 1931). The structure of these traditional theories consisted of an association between two elements. Current cognitive theory differs from these early educational psychologist. After a review of the literature, Biggs & Hinton (1995) stated, "Learning is a

process of knowledge construction rather than knowledge absorption and storage; people use what they already know in constructing new knowledge; and learning is closely related to the context in which it takes place" (p. 35).

In addition to contextual and associative learning theories, recent work on the individual learning preferences of students is important to the overall cognitive development of individuals. Applied mathematics assumes that students learn in differing ways. This idea of differing learning preferences is often called learning styles. Researchers have concluded that people learn in different manners and at different rates. The idea that individuals comprehend, order, and synthesize concepts in differing manners and at differing rates is the premise of learning styles. Lewis and Steinberger (1991) explained that learning style is the characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact, with, and respond to the learning environment. Numerous studies have confirmed that the majority of students can accomplish a task given in an educational environment that matches or compliments their learning style preference (Drummond, 1987; Dunn and Dunn, 1978; Kolb, 1984; Messick, 1984; Pumipuntu, 1992).

The work of cognitive psychology and learning style theories provided a theoretical base for this study. This research study was conducted with a foundational assumption that learning is greater for many students when methods accommodate active involvement and differing learning preferences. However, little documentation about student performance in applied mathematics courses was found. The bulk of recent research has centered around instructor and student perceptions and concerns related to applied academics (Bristow, 1994; Dennison, 1993; Greene, 1993; Kelly, 1993; Pollard, 1990). It was unclear just how effective the *Applied Mathematics* curriculum is and how well it is being implemented. With positive reports from teachers, students, and administrators, a study to determine the effect of these courses on student performance was warranted.

Objectives

The purpose of this study was to examine the performance of students enrolled in Applied Mathematics 1 and Applied Mathematics 2 courses based principally on the Center for Occupational Research and Development's *CORD Applied Mathematics* curriculum with any teacher supplemented material philosophically aligned with the CORD methodology. The specific objectives were:

1.   To compare the performance of students in Applied Math 1, Applied Math 2, and Algebra 1 on the ACT Work Keys competency based math assessment.
2.   To compare the performance of students in Applied Math 1, Applied Math 2, and Algebra 1 on the P-ACT + Pre-Algebra/Algebra assessment.

Related hypotheses were developed for the study.

Methods

This quasi-experimental study employed a posttest-only control group design to examine the performance of students in applied mathematics courses on two standardized math assessments. Students in Algebra 1 were also assessed as a control group to provide a means of comparison. Cluster sampling was used with random selection of intact classes.

109

Data were collected in late April as students completed course requirements. It was judged to be important to use two different types of mathematics assessment for this study. One assessment was selected to be more consistent with the type of instruction in applied math courses utilizing work-related mathematics problems. The second assessment was selected to be traditional in approach and provide a basis for comparison to a national norm group. Both of these assessments were developed by an outside agency to reduce the bias associated with designing a test specifically for a select population. The collection of data took two class periods. The first data collection involved assessing workplace mathematics skills of all participants using the Work Keys work-readiness assessment in math from ACT in addition to administering a descriptive survey to obtain participant information. The second data collection component took place the following day using the Pre-Algebra/Algebra subscores of the mathematics portion of the P-ACT+ Test from ACT.

School counselors then supplied coded individual mathematics and reading scores on the state mandated Missouri Mastery Achievement Test (MMAT) given to all eighth grade students. The General Linear Models (GLM) analysis of variance procedure indicated that a significant difference existed among MMAT scores in both reading and math. Therefore, the three sample groups were not homogeneous and the GLM equivalent to an Analysis of Covariance was used to statistically control for the groups entry skills. Thus, test scores after the treatment could be adjusted to more accurately reflect the influence of the treatment.

Data Sources

Four Missouri schools received a state-funded grant in 1993 to fully implement an Applied Mathematics curriculum based on the 36 units from CORD (1993) as well as three other applied courses. The schools each offer an Applied Math 1 course, Applied Math 2 course, as well as Algebra 1 and other advanced math courses. These were the schools selected to provide data for this study. Twenty-six class sections of Applied Mathematics and Algebra 1 in four Missouri schools were used to provide data for 490 students. Complete data sets were obtained from a total of 254 subjects. The data sets included scores on the Work Keys Applied Mathematics test, the Pre-Algebra/Algebra subscore of the Mathematics portion of the P-ACT+, and a demographic survey. Eighth grade MMAT Math and Reading scores were also obtained for each subject to serve as covariates.

Results/Conclusions

Descriptive data and eighth-grade MMAT scores were examined to ascertain profiles of students in the three classes. When asked which best described their last math class, nearly half of the students in Applied Math 1 responded 8th grade general math. However, 76% of the students in Algebra 1 reported pre-algebra/algebra (see Table 1).

Eighth-grade Missouri Mastery Achievement Test (MMAT) scores in Reading and Mathematics were a significant component of the data sets. These scores were obtained from counselors at the schools. The mean MMAT Math score for students in Applied Math 2 was 299 while the mean MMAT Math score for students in Algebra 1 was 372. Similarly, the mean MMAT Reading score for students in Applied Math 2 was 294, while the mean MMAT Reading score for students in Algebra 1 was 331 (see Table 2).

110

Table 1
Percentage of Students Reporting Last Math Class in which Subjects were Enrolled

	9th/10th grade General Math	Applied Math I	8th grade General Math	Pre-algebra Algebra
Applied Math 1	8%	8%	46%	38%
Applied Math 2	7%	61%	0%	32%
Algebra I	2%	4%	16%	76%

Table 2
Group Means of Eighth Grade MMAT Reading and Mathematics Scores

	Mathematics	Reading
Applied Math 1	287	286
Applied Math 2	299	294
Algebra 1	372	331

The General Linear Models (GLM) analysis of variance procedure indicated that a significant difference existed among MMAT scores in both reading and math. Least Squares Means (LSMeans) showed that a significant difference existed between MMAT scores for students in Algebra 1 and those in Applied Mathematics 1 and 2. However, there was not a significant differences between scores for students in Applied Mathematics 1 and 2.

The unadjusted and adjusted mean scores for students in the three groups for the Work Keys and the P-ACT+ are presented in Table 3.

Table 3
Unadjusted and Adjusted Mean Work Key Scores, Work Keys Levels and P-ACT+Pre-Algebra/Algebra Subscores for Students in Applied Mat 1, Applied Math 2, and Algebra 1

	Work Keys			P-ACT+Prealg/Alg	
	Unadjusted.	Level	Adjusted	Unadjusted.	Adjusted
Applied Math 1	18.13	4.18	19.24	7.89	8.79
Applied Math 2	18.88	4.28	19.66	9.22	9.85
Algebra	20.12	4.48	19.03	11.89	11.01

When the unadjusted mean P-ACT+ subscores were rounded to the nearest whole number for the three groups, the P-ACT+ scaled subscore was 6 for both Applied Math groups and 8 for

111

the Algebra 1 group. This scaled subscore is not terribly meaningful with the exception that it provides a basis of comparison with a 1992 national sample of 10th grade students. According to ACT (1995), a scaled subscore of 6 puts the Missouri applied mathematics sample groups at the 46th percentile--roughly in the middle of all 10th graders in the ACT sample group. The Algebra 1 group fell at the 71st percentile.

The first null hypothesis was:

HO1: There is no statistically significant difference among mean scores on the *Work Keys Applied Mathematics* assessment of students completing Applied Mathematics 1, Applied Mathematics 2, and Algebra 1 courses.

There was no significant difference among mean scores on the *Work Keys Applied Mathematics* test for students completing Applied Mathematics 1, Applied Mathematics 2, and Algebra 1 after adjusting for 8th grade MMAT scores through the use of a GLM analysis of covariance procedures (F=0.43; df = 4/249). Because the mean differences were not significant at the .05 alpha level, the null hypothesis (H01) was not rejected.

The second null hypothesis was:

HO2: There is no statistically significant difference among mean score on the P-ACT+assessment's Pre-Algebra/Algebra subscores of students completing Applied Mathematics 1, Applied Mathematics 2, and Algebra 1 courses.

A GLM analysis of covariance procedure revealed that there were significant differences among adjusted mean scores on the P-ACT+ Pre-Algebra/Algebra subscore (F=9.14;df = 4/249). The post hoc analysis indicated that there was no significant differences between the mean score of students in Applied Math 2 and students in Algebra 1 on the P-ACT+ Pre-Algebra/Algebra subscore when adjusted on MMAT reading and mathematics score (see Table 4). Likewise, no significant difference was indicated between the mean score of students in Applied Math 1 and students in Applied Math 2. However, a significant difference existed between the mean score of students in Applied Math 1 and students in Algebra 1 on the assessment's Pre-Algebra/Algebra subscore. Because the mean difference was significant at the .05 level, the null hypothesis (HO2) was rejected.

Table 4
Probability of Significant Differences Among the Least Squares Means for P-ACT+ Pre-Algebra/Algebra Scores

Group	P-ACT+LSMEAN	Pr>T	HO:LSMEAN	=	LSMEAN
Applied Math 1	8.79	1	0.08		0
Applied Math 2	9.85	2	0.06		
Algebra 1	11.01	3			

Based on the data obtained for the students in these four pilot schools, it was concluded that courses using an applied or contextual approach can provide students with the mathematics skills that will prepare them for the workplace or for additional study in mathematics.

112

Some question the value of applied curricula over the traditional academic approach. The results of this study are important to various individuals and groups in helping to judge the success of courses emphasizing an applied or contextual approach.

The results of this study leads to several areas of discussion. Isolating curriculum and instructional strategies in educational research is very difficult because of external factors such as class selection by students and previous experience in mathematics. As such, statistical control and qualitative judgments were necessary to aid in interpreting the findings.

Many teachers were excited about the interest and progress that students displayed using the applied approach. It was difficult, however, to relate these observations directly to performance progress data because of confounding variables. A concern raised early in the study involved the entry skills of students enrolling in applied math. Use of 8th grade Missouri Mastery Achievement Test (MMAT) scores in reading and math as covariate variables provided a method to statistically adjust mean scores for entry skills, allowing a more meaningful assessment of student progress as a result of class instruction and curriculum.

The comparable math progress that was made by the Applied Mathematics 2 group when compared to the Algebra 1 group may well be attributable to the contextual and associative learning theories described in the theoretical base section. The *Applied Mathematics* curriculum provided for a hands-on approach that actively engages the learner. As stated earlier, "Cognitive learning theory views the learner as a very active participant in the learning process" (Royer & Allen, 1978). Applied learning proponents frequently mentioned that some students truly comprehend only after active participation. For some, construction in the classroom through psychomotor means precedes construction in the cognitive. These students often prefer to learn through hands-on, activity centered projects like those used in applied math.

Further consideration of student performance on the *Work Keys Applied Mathematics* assessment also raised questions. Surprisingly, the first and second year students in applied math did not score significantly different on the *Work Keys* exam. Although no hypothesis was developed comparing the scores of the two groups, it might be assumed that the second year group would score better than the first. One explanation could be that *Work Keys Applied Mathematics* is designed to assess job entry behavior and primarily addresses only those skills covered in the first 15 units of CORD *Applied Mathematics*.

Educational leaders as well as local school districts should be better prepared to make informed decisions concerning the use of applied mathematics courses. The performance of students in these courses has been documented, providing decision makers additional information needed to help derive reasoned conclusions about the role of applied approaches in education.

References

Balsam, P. D. (1985). The functions of context in learning and performance. In   Balsam, P. D. and Tomie, A. (Eds.) *Context and Learning.* Hillsdale, NJ: Lawrence Erlbaum associates.

Biggs, B. T., & Hinton B. E. (1995) *UCVE/Professional development influences and questions.* Manuscript submitted for publication.

Bragg, D. D., Layton, J. D., & Hammons, F. T. (1994). *Tech Prep implementation in the United States: Promising trends and lingering challenges.* Berkeley, CA: National Center for Research in Vocational Education, University of California at Berkeley. (ERIC Document Reproduction Service No. ED 374 336).

Bristow, D. H. (1994). *The role and essential elements for high quality tech prep programs in Missouri.* (Doctoral dissertation, University of Missouri, 1994).

Brustein, M. (1993). *AVA guide to federal funding for Tech Prep.* Alexandria, VA: American Vocational Association.

CORD. (1993). *CORD Applied mathematics.* Waco, TX: Center for Occupational Research and Development.

Custer, R. L., Ruhland, S. K., & Stewart, B. R. (1995). *Assessing Tech Prep implementation.* Columbia, MO: Staff, Study Department of Practical Arts and Vocational-Technical Education, University of Missouri-Columbia.

Dennison, B. C. (1993). The stages of concern of technical preparation education among secondary and postsecondary vocational and academic classroom educators, guidance counselors, and administrators. (Doctoral dissertation, University of Missouri, 1993). *Dissertation Abstracts International, 54*(12), 4418.

Drummond, R. J. (1987). Learning style inventory. In D. J. Keyser & R. C. Sweetland (Eds.), *Test Critiques: Volume VI* (pp. 308-312). Kansas City, MO: Test Corporation of America.

Dunn, R. L. & Dunn, K. J. (1978). *Teaching students through their individual learning styles: A practical approach.* Reston, VA: Reston Publishing Co., Inc.

Greene, J. T. (1993). Academic and vocational teachers' concerns about tech prep as measured by the concerns-based adoption model. Doctoral dissertation, The University of Tennessee, 1993. *Dissertation Abstracts International, 54* (06), 2127.

Gunthrie, E. R. (1935) *The psychology of learning.* New York: Harper & Row.

Hull, C. L. (1943) *Principles of behavior.* New York: Appleton, Century, Crofts.

Hull, D. M. and Parnell, D. (1991). *Tech Prep associate degree: A win/win experience.* Waco, TX: The Center for Occupational Research and Development.

Kelly, J. A. (1993). Perceptions of South Carolina's applied communication teachers regarding the applied communication course. (Doctoral dissertation, University of South Carolina, (1993). *Dissertation Abstracts International, 54* (07),2445

Kolb, D. A. (1994). *Experiential learning: Experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice-Hall.

Lewis, A. and Steinberger, E. (1991). *Learning styles: Putting research into practice.* Arlington, VA. American Association of School Administrators.

Marshall, R. and Tucker, M. (1992). *Thinking for a living: Education and the wealth of nations.* New York: Basic Books.

114

Messick, S. (1984). The nature of cognitive styles: Problems and Promise in education practice. *Psychologist, 19*, 59-74.

Pollard, R. R. (1990). A comparison of the attitudes of university vocational teacher education department chairs and postsecondary deans of instruction toward tech-prep programs. (Doctoral dissertation, The University of Nebraska). *Dissertation Abstracts International, 51*(06), 1998.

Pumipuntu, S. (1992). *Learning styles & problem solving of industrial arts students in teachers college in Northeast Thailand.* Unpublished doctoral dissertation, University of Missouri-Columbia.

Resnick, L. B. and Klopfer, L. E. (1989). Toward the thinking curriculum: An overview. <u>1989 ASCD Yearbook: Toward the Thinking Curriculum.</u> Washington, DC: Association of Supervision and Curriculum Development.

SCANS. (1991) *What work requires of schools: A SCANS report for America 2000.* Washington, DC: US Department of Labor.

Thorndike, E. L. (1931). *Human learning.* New York: Century.

The Importance of Workplace Basics Competencies (SCANS)

as

Perceived by Secondary Vocational Education Teachers

Lonnie Echternacht
University of Missouri-Columbia
Columbia, Missouri

and

Ling-Yu Melody Wen
National Chang-Hua University of Education
Chang-Hua, Taiwan
Republic of China

Abstract

Today, many school, business, community, and government leaders recognize the importance of education for the workplace. The study was conducted to determine the importance of workplace basics competencies (SCANS) for workers as perceived by secondary vocational teachers of agriculture, business, family and consumer sciences, marketing, and technology and industry. The importance ratings of the workplace basics competencies for all five groups were high. Areas of both agreement and disagreement existed among the vocational education teachers' perceptions of the importance of workplace basics competencies.

Introduction

The explosive growth of technology and international business is impacting all types and sizes of businesses in this information decade. Today's workplace is changing. Eurich (1985), National Academy of Sciences et al. (1984), and U.S. Department of Labor (1993) reported that employers are often dissatisfied with the quality of high school graduates. Parnell (1991) concluded that a large number of high school graduates lack the basic skills that are important for success in today's workplace. The U.S. Department of Labor (1992) emphasized that teachers must educate young people more effectively in schools and produce qualified workers who have both the technical skills and basic skills to work productively in today's workplace.

The Secretary's Commission on Achieving Necessary Skills (SCANS) Report (U.S. Department of Labor, 1991) addressed "workplace know-how" and has captured the attention of educators, parents, politicians, and business leaders. The Commission examined the changes that have occurred in the world of work and the demands of the current workplace. The SCANS report

presented the results of a national survey concerning the importance of workplace basics competencies as perceived by employers and employees in 50 different occupations in business and industry. The Commission reported that students must master workplace basics competencies, in addition to job specific skills, if students are to find and keep good jobs in today's job market.

The SCANS report indicated that the five competency domains of "workplace know-how" (Resources, Information, Interpersonal Skills, Systems, and Technology) encompassed 20 workplace basics competencies needed by all employees. The Commission concluded that the competencies are applicable from the shop floor to the executive suite and should be taught in an integrated fashion, reflecting the workplace context in which they are applied. In addition, the Commission recommended that educators need to begin early to help students see the relationships between what they study and contextual applications in the real world.

Two recent studies of business teachers' perceptions of the importance of the workplace basics competencies (SCANS) have been completed by the researchers. One study (Echternacht & Yang, 1995b) compared the perceived importance of the workplace basics competencies (SCANS) between secondary business teachers who taught in comprehensive high schools and in area vocational schools. A significant difference was found in the responses of the two teacher groups regarding the perceived importance of the "Exercises Leadership" workplace basics competency. Area vocational school business teachers rated the competency higher than comprehensive high school business teachers. The second study (Echternacht & Yang, 1995a) examined differences in the perceptions of beginning and experienced business teachers relative to their importance ratings of the workplace basics competencies (SCANS). The importance ratings of the workplace basics competencies for both groups of business teachers were high--5.8 for beginning business teachers and 5.5 for experienced business teachers using a 7.0 scale. There were significant differences in the importance ratings of 14 of the 20 workplace basics competencies. Of the 14 competencies that were rated significantly different, beginning teachers rated 11 of the competencies higher than experienced teachers.

Today, school, business, community, and government leaders are recognizing the importance of education for the workplace and the need for collaboration when preparing students to enter, make progress, and achieve success in the workplace. Do secondary vocational teachers of agriculture, business, family and consumer sciences, marketing, and technology and industry perceive that workplace basics competencies (SCANS) are important? What is the perceived importance of workplace basics competencies (SCANS) by secondary vocational education teachers in agriculture, business, family and consumer sciences, marketing, and technology and industry programs?

Purpose

The purpose of the study was to determine the importance of workplace basics competencies (SCANS) for workers as perceived by vocational education teachers in secondary schools, specifically teachers of agriculture, business, family and consumer sciences, marketing, and technology and industry. This information should help vocational teacher educators prepare beginning teachers and inservice experienced teachers to better equip students for the workplace, assisting students transition from school to work and closing the gap between the classroom and the workplace.

This descriptive study was designed to answer the following research questions:

117

1. What is the perceived importance of workplace basics competencies (SCANS) by secondary vocational teachers of agriculture, business, family and consumer sciences, marketing, and technology and industry?

2. Are there any significant differences in the perceived importance of workplace basics competencies (SCANS) among secondary vocational education teachers in the following five program areas: agriculture, business, family and consumer sciences, marketing, and technology and industry?

Methodology

Data for the study were collected by a survey questionnaire. The questionnaire was adapted from the SCANS Report competencies and included the 20 competencies the Commission identified. The Workplace Basics Competencies (SCANS) Questionnaire was divided into three sections containing 26 items: 20 items concerning the workplace basics competencies, one comment question pertaining to respondents' perceptions of the three most important competencies, and five items for collecting demographic information. A seven-point Likert-type scale for responding to each of the 20 workplace basics competencies, ranging from "very important" (7) to "not important" (1), was used.

The population consisted of vocational education teachers in Missouri public secondary schools. A list of vocational teachers identified by program areas was obtained from the State Department of Elementary and Secondary Education in September 1995. Randomly selected samples of 100 teachers each from five specific vocational program areas (agriculture, business, family and consumer sciences, marketing, and technology and industry) were sent questionnaires. Usable responses were received from 70 agriculture teachers, 78 business teachers, 73 family and consumer sciences teachers, 75 marketing teachers, and 69 technology and industry teachers.

To allow statistical analysis of the data, the "not important" ratings through "neutral" ratings (from 1 to 4) were combined. A chi-square test of independence was used to determine if significant differences existed among the responses of vocational education teachers from the five program areas. The .05 level of significance was used. Means, percents, and rankings were used to describe the data obtained in the study.

Findings

A summary of the responses of the five groups of vocational education teachers relative to their importance ratings of the workplace basics competencies (SCANS) is presented in Table 1. The importance ratings of the workplace basics competencies (SCANS) were high for all five groups of vocational education teachers. The average rating of importance for the 20 competencies, using a 7.0 scale, was 5.74 for both agriculture and family and consumer sciences teachers, 5.68 for business teachers, 5.46 for marketing teachers, and 5.25 for technology and industry teachers.

Analysis of the importance ratings of the workplace basics competency domains revealed that agriculture teachers rated the Resources Domain most important (6.21), business teachers rated the Information Domain most important (6.12), both family and consumer sciences and marketing teachers rated the Interpersonal Skills Domain most important (5.98), and technology and industry teachers rated the Technology Domain most important (5.52). Of the five different domains, the Interpersonal Skills Domain was rated most important overall by the five groups of vocational education teachers. The Interpersonal Skills Domain had a combined 5.86 mean rating of importance. The domain rated least important overall by the five groups of vocational education

118

teachers was the Systems Domain with a 5.05 combined mean rating. With the exception of agriculture teachers, the remaining four groups of vocational education teachers rated the Systems Domain least important.

There were both similarities and differences in the rankings of importance of the 20 workplace basics competencies (SCANS) by the five groups of vocational teachers (Table 2). The workplace basics competencies (SCANS) ranked most important by the five vocational teacher groups follows: both family and consumer sciences teachers (6.71) and business teachers (6.46) ranked Competency 9—Participates as a Member of a Team, marketing teachers (6.65) ranked Competency 11—Serves Clients/Customers, agriculture teachers (6.56) ranked Competency 3—Allocates Material and Facility Resources, and technology and industry teachers (6.19) ranked Competency 1—Allocates Time. In contrast, Competency 17—Improves and Designs Systems was ranked least important by three of the teacher groups [business (4.84), family and consumer sciences (4.94), and marketing (4.57)]; Competency 14—Works with Cultural Diversity was ranked least important by agriculture teachers (4.94); and Competency 2—Allocates Money was ranked least important by technology and industry teachers (4.50).

A comparison of the top four ranked competencies by the five vocational teacher groups revealed that two of the same competencies (C1 and C9) appeared on each group's list and one competency (C11) appeared on four of the five lists. Also, a comparison of the four competencies ranked least important by the five vocational teacher groups revealed that one competency (C16) appeared on each group's list and three of the competencies (C15, C17, and C20) appeared on three different groups' lists.

A summary of the responses of the five groups of vocational education teachers indicating the extent to which workplace basics competencies (SCANS) are perceived as important by each group is presented in Table 3. Significant differences were found in the responses of the five vocational teacher groups regarding the importance of 17 of the 20 competencies (all competencies expect C9—Participates as a Member of a Team and C13—Negotiates to Arrive at a Decision (Interpersonal Skills Domain) and C15—Understands Systems (Systems Domain).

Further analysis of the data (Tables 1 and 3) revealed that business teachers rated C1—Allocates Time (Resources Domain) and C5—Acquires and Evaluates Information, C6—Organizes and Maintains Information, and C8—Uses Computers to Process Information (Information Domain) competencies considerably more important than the other four groups of vocational education teachers. In addition, agriculture teachers rated the following three competencies more important: C3—Allocates Material and Facility Resources (Resources Domain), C12—Exercises Leadership (Interpersonal Skills Domain), and C17—Improves and Designs Systems (Systems Domain). The technology and industry teacher group rated C18—Selects Technology (Technology Domain) more important than the other four teacher groups.

In contrast, technology and industry teachers rated C2—Allocates Money, C3—Allocates Material and Facility Resources, and C4—Allocates Human Resources (Resources Domain); C6—Organizes and Maintains Information, C7—Interprets and Communicates Information, and C8—Uses Computers to Process Information (Information Domain); and C11—Serves Clients/Customers (Interpersonal Skills Domain) competencies considerably less important than the other four vocational education teacher groups. Also, agriculture teachers rated C14—Works with Cultural Diversity (Interpersonal Skills Domain) less important than the other four groups of teachers, and marketing teachers rated C19—Applies Technology to Task and C20—Maintains and Troubleshoots Technology (Technology Domain) less important.

Table 1

Importance Ratings of Workplace Basics Competencies (SCANS) by Vocational Education Teachers

Workplace Basics Competency	Vocational Teachers' Mean Ratings				
	Agr.	Bus.	F&CS	Mktg.	T&I
Domain 1--Resources					
C1 Allocates Time	6.19	6.44	6.38	6.04	6.19
C2 Allocates Money	6.13	5.04	5.67	4.96	4.50
C3 Allocates Material and Facility Resources	6.56	5.22	5.81	5.26	4.75
C4 Allocates Human Resources	5.94	5.31	5.81	5.43	4.81
Domain 2--Information					
C5 Acquires and Evaluates Information	5.50	5.87	5.57	5.57	5.06
C6 Organizes and Maintains Information	5.56	6.32	6.00	5.52	5.19
C7 Interprets and Communicates Information	5.25	5.99	5.81	5.83	5.50
C8 Uses Computers to Process Information	5.44	6.30	5.62	5.74	5.19
Domain 3--Interpersonal Skills					
C9 Participates as a Member of a Team	6.38	6.46	6.71	6.52	6.13
C10 Teaches Others	5.81	5.77	5.62	5.78	5.38
C11 Serves Clients/Customers	6.25	6.42	6.24	6.65	5.38
C12 Exercises Leadership	6.00	5.44	5.52	5.65	5.19
C13 Negotiates to Arrive at a Decision	5.75	5.56	5.67	5.57	5.31
C14 Works with Cultural Diversity	4.94	6.27	6.14	5.70	5.63
Domain 4--Systems					
C15 Understands Systems	5.38	5.32	5.71	4.87	4.69
C16 Monitors and Corrects Performance	5.44	5.13	5.05	4.65	4.63
C17 Improves and Designs Systems	5.69	4.84	4.90	4.57	4.88
Domain 5--Technology					
C18 Selects Technology	5.50	5.42	5.48	5.13	5.75
C19 Applies Technology to Task	5.63	5.53	5.86	5.00	5.69
C20 Maintains and Troubleshoots Technology	5.50	4.89	5.14	4.70	5.13

Table 2

Rankings of Workplace Basics Competencies (SCANS) by Vocational Education Teachers

Rank	Agriculture Teachers Comp.	Mean	Business Teachers Comp.	Mean	Fam. & Cons. Sc. Teachers Comp.	Mean	Marketing Teachers Comp.	Mean	Tech. & Ind. Teachers Comp.	Mean
1	C3	6.56	C9	6.46	C9	6.71	C11	6.65	C1	6.19
2	C9	6.38	C1	6.44	C1	6.38	C9	6.52	C9	6.13
3	C11	6.25	C11	6.42	C11	6.24	C1	6.04	C18	5.75
4	C1	6.19	C6	6.32	C14	6.14	C7	5.83	C19	5.69
5	C2	6.13	C8	6.30	C6	6.00	C10	5.78	C14	5.63
6	C12	6.00	C14	6.27	C19	5.86	C8	5.74	C7	5.50
7	C4	5.94	C7	5.99	C3*	5.81	C14	5.70	C10	5.38
8	C10	5.81	C5	5.87	C4*	5.81	C12	5.65	C11	5.38
9	C13	5.75	C10	5.77	C7*	5.81	C5*	5.57	C13	5.31
10	C17	5.69	C13	5.56	C15	5.71	C13*	5.57	C6*	5.19
11	C19	5.63	C19	5.53	C2*	5.67	C6	5.52	C8*	5.19
12	C6	5.56	C12	5.44	C13*	5.67	C4	5.43	C12*	5.19
13	C5*	5.50	C18	5.42	C8*	5.62	C3	5.26	C20	5.13
14	C18*	5.50	C15	5.32	C10*	5.62	C18	5.13	C5	5.06
15	C20*	5.50	C4	5.31	C5	5.57	C19	5.00	C17	4.88
16	C8*	5.44	C3	5.22	C12	5.52	C2	4.96	C4	4.81
17	C16*	5.44	C16	5.13	C18	5.48	C15	4.87	C3	4.75
18	C15	5.38	C2	5.04	C20	5.14	C20	4.70	C15	4.69
19	C7	5.25	C20	4.89	C16	5.05	C16	4.65	C16	4.63
20	C14	4.94	C17	4.84	C17	4.90	C17	4.57	C2	4.50

*Competency mean scores are tied, thus the indicated rank of individual competencies may need to be adjusted.

121

129

130

Table 3

Percent of Vocational Education Teachers Indicating Different Degrees of Importance of Workplace Basics Competencies (SCANS)

SCANS Comp.	Agriculture Tchrs' Responses# N=70				Business Tchrs' Responses# N=78				Fam & Cons Sciences Tchrs' Responses# N=73				Marketing Tchrs' Responses# N=75				Tech & Industry Tchrs' Responses# N=69				Chi Square
	4	5	6	7	4	5	6	7	4	5	6	7	4	5	6	7	4	5	6	7	
C1	7.1	11.4	50.0	31.4	6.4	5.1	25.6	62.8	5.5	4.1	42.5	47.9	9.3	17.3	34.7	38.7	11.6	13.0	43.5	31.9	29.98°
C2	8.6	7.1	57.1	30.0	34.6	19.2	24.4	21.8	9.6	23.3	47.9	19.2	30.7	30.7	21.3	17.3	56.5	11.6	18.8	13.0	84.16°
C3	12.9	18.6	25.7	42.9	26.9	28.2	26.9	17.9	6.8	27.4	45.2	20.5	22.7	29.3	44.0	4.0	43.5	5.8	43.5	7.2	81.52°
C4	17.1	5.7	31.4	45.7	28.2	15.4	28.2	28.2	8.2	19.2	42.5	30.1	17.3	21.3	38.7	22.7	49.3	8.7	23.2	18.8	54.12°
C5	12.9	37.1	38.6	11.4	9.0	21.8	30.8	38.5	13.7	24.7	38.4	23.3	16.0	18.7	40.0	25.3	18.8	31.9	37.7	11.6	26.76°
C6	5.7	50.0	25.7	18.6	5.1	9.0	32.1	53.8	5.5	27.4	28.8	38.4	13.3	26.7	44.0	16.0	30.4	33.3	17.4	18.8	87.19°
C7	7.1	18.6	31.4	42.9	7.7	17.9	33.3	41.0	5.5	19.2	38.4	37.0	12.0	13.3	34.7	40.0	24.6	18.8	18.8	37.7	21.47°
C8	11.4	44.3	24.3	20.0	5.1	10.3	28.2	56.4	9.6	42.5	23.3	24.7	21.3	17.3	22.7	38.7	23.2	26.1	37.7	13.0	69.39ª
C9	8.6	7.1	28.6	55.7	3.8	10.3	17.9	67.9	4.1	5.5	23.3	67.1	4.0	9.3	17.3	69.3	5.8	13.0	31.9	49.7	13.58
C10	12.9	35.7	8.6	42.9	9.0	28.2	30.8	32.1	19.2	19.2	38.4	23.3	13.3	12.0	48.0	26.7	18.8	43.5	5.8	31.9	62.10°
C11	5.7	14.3	30.0	50.0	6.4	1.3	29.5	62.8	6.8	9.6	38.4	45.2	5.3	4.0	30.7	60.0	24.6	13.0	31.9	30.4	42.51ª
C12	24.3	5.7	12.9	57.1	17.9	37.2	17.9	26.9	17.8	15.1	46.6	20.5	13.3	34.7	12.3	34.8	31.9	31.9	18.8	17.4	75.11°
C13	10.0	27.1	32.9	30.0	16.7	25.6	33.3	24.4	15.1	24.7	31.5	28.8	20.0	26.7	17.3	36.0	21.7	37.7	10.1	30.4	20.98
C14	31.4	31.4	5.7	31.4	5.1	12.8	30.8	51.3	11.0	11.0	30.1	47.9	10.7	30.7	26.7	32.0	17.4	26.1	29.0	27.5	54.57°
C15	25.7	24.3	37.1	12.9	20.5	34.6	26.9	17.9	19.2	38.4	28.8	13.7	29.3	34.7	22.7	13.3	36.2	39.1	13.0	11.6	17.86
C16	22.9	18.6	40.0	18.6	29.5	26.9	28.2	15.4	20.5	42.5	27.4	9.6	33.3	36.0	22.7	8.0	43.5	33.3	7.2	15.9	35.33°
C17	8.6	35.7	38.6	17.1	38.5	32.1	17.9	11.5	28.8	41.1	19.2	11.1	38.7	26.7	25.3	9.3	37.7	36.2	8.7	17.4	36.54°
C18	11.4	38.6	30.0	20.0	15.4	30.8	33.3	20.5	13.7	37.0	24.7	24.7	22.7	30.7	33.3	13.3	24.6	13.0	24.6	37.7	26.90°
C19	4.3	44.3	31.4	20.0	15.4	25.6	34.6	24.4	12.3	20.1	32.9	24.7	28.0	26.7	36.0	9.3	18.8	18.8	37.7	24.6	29.20ª
C20	25.7	24.3	24.3	25.7	33.3	32.1	26.7	7.7	27.4	39.7	13.7	19.2	48.0	18.7	17.3	16.0	30.4	20.3	30.4	18.8	28.87°

#Column No. 4 indicates percent of respondents who indicated the combined ratings from 1 to 4 ("not important" to "neutral"); No. 5 and No. 6 indicates those who responded between "neutral" and "very important"; and No. 7 indicates those who responded "very important."

°p < .05.

131

122

132

Conclusions

Areas of both agreement and disagreement exist among the perceptions of vocational education teachers regarding the importance of the workplace basics competencies (SCANS). The data revealed that the five groups of vocational education teachers identified in this study (agriculture, business, family and consumer sciences, marketing, and technology and industry) have high perceptions regarding the importance of workplace basics competencies (SCANS). The results of this study are consistent with the SCANS Report (U.S. Department of Labor, 1991) concerning the importance of workplace basics competencies (SCANS) for business and industry employees as perceived by employers and employees.

The five vocational teacher groups tend to identify two of the competencies as being most important (C9--Participates as a Member of a Team and C1--Allocates Time). The two competencies were ranked at or near the top by each of the vocational teacher groups. There were considerable differences in the perceived importance rankings of the five workplace basics competency (SCANS) domains by the vocational teacher groups. While not unanimous, the Systems Domain tends to be ranked least important by vocational education teachers (ranked least important by four of the five groups).

The five vocational teacher groups tend to differ greatly in their perceptions of the importance of the workplace basics competencies (SCANS)--17 of the 20 were significantly different. The competencies that were rated differently by the vocational education teachers were distributed across all five domains: Resources (4), Information (4), Interpersonal Skills (4), Systems (2), and Technology (3). The three competencies rated similarly by the five vocational teacher groups are C9--Participates as a Member of a Team, C13--Negotiates to Arrive at a Decision, and C15--Understands Systems.

Recommendations

Since the importance attached to workplace basics competencies (SCANS) by secondary vocational education teachers can be identified, special or added attention should be given by teacher educators to develop appropriate instructional/learning strategies that ensure these competencies are developed by all students. Teacher education programs need to address the teaching of workplace basics competencies (SCANS) for both prospective teachers and those already involved in the profession. Because most states require a minimum number of days of seat-time-based school instruction and programs tend to reflect these minimums, teachers need to devise ways to incorporate the development of workplace basics competencies (SCANS) into the continually evolving, already crowded curriculum. Successful workplace basics instructional/ learning strategies must be shared among teachers and administrators as well as teacher educators.

To assist teachers in teaching the SCANS competencies to their students, the SCANS Commission developed Teaching the SCANS Competencies (U.S. Department of Labor, 1993). This publication provides practical suggestions for designing and implementing instructional experiences as well as descriptions of actual programs that focus on developing workplace basics competencies (SCANS). In addition, SCANS Blueprint for Action: Building Community Coalitions (U.S. Department of Labor, 1992a) provides suggestions for becoming involved, summarizes resources that can be used in developing workplace basics skills and concepts, and presents typical real-world examples of the competencies.

Workplace basics skills and concepts can and should be integrated into each subject matter area, both in the vocational-technical curricula as well as in the academic curriculum areas. Teachers need to help students connect knowledge and skills learned in classrooms to the workplace so students understand typical applications and real-world uses of the course content

students are studying. These connections need to be made intellectually explicit, and the emphasis should be on teaching skills and knowledge in context. Teaching in context implies that students are provided opportunities to apply these workplace basics in real-life situations or simulations, e.g., problems or projects related to workplace situations as well as internships, mentorships, and "shadowing" workers on the job.

Along with the emphasis on learning in context, teachers need to implement instructional/ learning strategies that focus on students becoming more responsible for and active in their own learning. Linkages between education and the workplace need to be strengthened to help develop appropriate curricula which include workplace basics competencies (SCANS) and meet the needs of students entering today's workforce.

References

Echternacht, L. & Yang, L. M. W. (1995). The importance of workplace basics competencies (SCANS) as perceived by beginning business teachers and experienced business teachers. In D. H. Redmann (Ed.) *Business Education and Information Systems Research Special Interest Group Proceedings: American Educational Research Association* (pp. 39-48). Baton Rouge, LA: Louisiana State University.

Echternacht, L. & Yang, L. M. W. (1995). The importance of workplace basics competencies (SCANS) as perceived by business teachers. *NABTE Review, 22,* 38-41.

Eurich, N. P. (1985). *Corporate classrooms: The learning business.* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching. (ERIC Document Reproduction Service No. ED 264 785)

National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. (1984). *High Schools and the Changing Workplace: The Employer's View.* Report of the Panel on Secondary School Education or the Changing Workplace. Washington, DC: National Academy Press.

Parnell, D. (1991). *The Neglected Majority.* Washington, DC: Community College Press.

U.S. Department of Labor. (1991). *What work requires of school--A SCANS report for America 2000.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor. (1992). *School-to-work connections: Formulas for success.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor. (1993). *Teaching the SCANS competencies.* Washington, DC: U.S. Department of Labor.

$\mathcal{C}\mathcal{E}$ 072 281

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

ERIC®

REPRODUCTION RELEASE
(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Research for Education in a Democratic Society. Proceedings of the 1996 Vocational Education Special Interest Group.	
Author(s): Joyner, Randy L., Editor	
Corporate Source:	Publication Date: April, 1996

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce the identified document, please CHECK ONE of the following options and sign the release below.

X	Sample sticker to be affixed to document	Sample sticker to be affixed to document ➡	
Check here Permitting microfiche (4"x 6" film), paper copy, electronic, and optical media reproduction	"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY ───── Sample ───── TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."	"PERMISSION TO REPRODUCE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY ───── Sample ───── TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."	**or here** Permitting reproduction in other than paper copy.
	Level 1	Level 2	

Sign Here, Please

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Signature: *Randy L. Joyner*	Position: Editor
Printed Name: Randy L. Joyner	Organization: Area Vocational Education SIG
Address: East Carolina University BVTE, 2317 General Classroom Bldg Greenville, NC 27858-4353	Telephone Number: (919) 328-6983 Date: September 4, 1996

OVER

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON·ERIC SOURCE):

If permission to reproduce is not granted to ERIC , or, if you wish ERIC to cite the availability of this document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly·more stringent for documents which cannot be made available through EDRS).

Publisher/Distributor:	
Address:	
Price Per Copy:	Quantity Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name and address of current copyright/reproduction rights holder:

Name:

Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

Acquisitions Coordinator
ERIC/ACVE
1900 Kenny Road
Columbus, OH 43210-1090

If you are making an unsolicited contribution to ERIC, you may return this form (and the document being contributed) to:

9/91)