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Impact of collaborative approach in workplace education classes on participants' achievement and attitudes

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IMPACT OF COLLABORATIVE APPROACH IN WORKPLACE EDUCATION CLASSES
ON PARTICIPANTS' ACHIEVEMENT AND ATTITUDES

by

MARY I. JARVIS

DISSERTATION

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

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Approved by:

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DEDICATION

I wish to dedicate this dissertation to my late husband, Jim, who always encouraged me to pursue my goals. I also wish to dedicate this work to my three children, James, Mary F. and Ann who supported me and endured my preoccupation while I was undertaking this endeavor. They have been patient with fast fixed meals and lack of attention to house maintenance. They have been helpful in undertaking tasks that I normally assume.

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CHAPTER I

INTRODUCTION

In the past, workers in urban areas with few literacy skills in reading, math, communication and problem solving were able to find work doing repetitive, muscle jobs, for example in the auto industry. Workers now need higher level literacy skills to read operator guidelines and procedures, math skills to use SPC (Statistical Process Control) and CNC (Computer Numerical Control), and soft skills to collaborate with others in communicating ideas, listening to other viewpoints, and working together. At the same time more and more emphasis is being placed on cross-functional, self directed team, in which workers are able to work together with fellow workers of diverse backgrounds to analyze, solve problems, and make informed decisions for which they take responsibility. (Phillipi, 1994) These changes in the workplace are evident in urban plants, such as those that supply the auto industry, and waste management, as well as other businesses and industries.

To help workers adapt to this changed workplace, companies are providing classes to upgrade skills. Some of these programs have had some short term benefits, but workers retain skills only for a short period of time. (Mikulecky, 1986, 1989, 1992; Mickulecky & Lloyd, 1996; Sticht, 1988)) Given that these programs have not been effective over the long term, other instructional approaches should be considered. Collaboration, working together in small groups for a common end, has been shown to be an effective way to learn. This approach has been supported by learning theory (Barnes, 1975; Dewey, 1938; Freire, 1970; Glasser, 1986; Vygotsky, 1962) and educational research. Research studies in classroom instruction have shown many benefits for group

work in classrooms. Studies in elementary and secondary schools have shown increases in learning: higher levels of thinking, ability in getting along with persons of diverse backgrounds, as well as self esteem and effectiveness in social interactions. (Bird & Brame, 1978; Dansereau, 1984; Garibaldi, 1976; Frierson, 1967; Johnson and Johnson,1989; Slavin,1983)

However, there is little indication that collaboration has been used with adult populations, especially in workplace education classes. Since there is evidence that collaboration has been effective in other settings, a collaborative approach to learning should be considered for workplace education classes, certainly because of the learning benefits but also because of the workplace need for workers who can work effectively in teams.

This study investigated the possible benefits of collaboration as an instructional approach with adult populations in workplace settings. This study examined methods used in three workplace classrooms to determine if collaboration facilitated learning and positive attitudes toward learning in participants in workplace education classes.

Statement of the Problem

The need for workplace education is apparent, but the use of collaboration as an effective instructional approach to use in these programs needs to be considered. This section will identify three areas of concern: 1. Workplace needs 2. Current programs to address those needs, and 3. How collaborative learning can meet those needs.

Workplace Needs

Changes in the workplace are demanding new learning in workplace education. Many companies are attempting to update workers' skills to meet the demands of today's

workplace. Previously, workers with few literacy skills in reading, math, communication, and problem solving were gainfully employed. As long as a worker had a strong back, willing attitude, and showed up for work on time, he was successful. He was shown how to do the work and then expected to perform the designated task. The supervisor or foreman monitored, inspected, and assumed responsibility for the quality of products and services produced. The worker was thought of as a cog in the wheel of production. This is no longer true.

Today's workers are expected to become more actively involved in the quality and total production process. There is an increasing need for workers who are committed, competent and communicative to benefit the organization, its product or service, and its customers. Workers need to be able to effectively interact and collaborate, to communicate ideas, listen to other viewpoints in order to learn from each other, and work together as a team.

To understand the context of the current workplace, demands of workers at the global as well as the local level that impact workplace education will be examined

Global Market Competition Demands Competent Workers

In order to compete in the global market, industries are realizing their need for new technology and highly trained, competent, flexible workers who can not only use the new equipment but also make quality decisions and take responsibility for these decisions. Thurow (1992) emphasizes that in the next century, "the education and skills of the workforce will end up being the competitive weapon." (p.40) He points out that the United States falls behind Germany and Japan in providing mid-level, non college skills. Gordon et al., (1991) also emphasizes the need for better educated and trained workers for

American companies to remain competitive in the global market. Companies need to upgrade workers to meet these global demands.

Local Work Organizations Demand New Tasks and Skills of Workers.

To compete in the global market, local industries are becoming "leaner and meaner" by downsizing and establishing cross functional, self directed work teams. Workers are expected to know jobs other than just their own. More sophisticated equipment, such as robots and computer numerical control machinery (CNC), are replacing older, manually operated equipment. Workers must deal with new measures, such as collecting and analyzing products for service quality. These include statistics to measure cycle time, scrapped products, reworked materials, and consistent product quality (Phillipi, 1994). New equipment and procedures, previously spread across wider time increments, are now introduced at a faster pace. New procedures focus on improvements in product and service quality and increased worker responsibility for that quality.

Work Organizations Expect Collaborative Involvement of Workers.

Shifts are being made toward self-directed teams with emphasis on quality of production and services (Phillipi, 1994). Workers need to have communicative and collaborative skills to work effectively in these teams. Teams members, often workers of diverse backgrounds, need to know how to listen and to learn from each other as well as how to communicate ideas and work out problems that arise on the job.

Additionally, many organizations are realizing that collective learning is more productive than isolated individual efforts. There is a small but increasing interest in transforming workplaces into "learning organizations," which are learning communities in which all employees learn with and from each other and contribute to the betterment of the

organization (Dixon 1994, Senge et al, 1990). There is a need for each worker to function as a contributing member of the organization, to be aware of the total work picture and realize the contribution each worker can make, individually and as a team. Workers are beginning to be seen as valuable resources who can provide needed input in products, processes and service (McVey, 1995).

Changes in the Workplace Demand Higher Standards of Workers.

Because of changes in the workplace, organizations are now demanding different skills and competencies. In response to Goals 2000 and School to Work legislation in 1993, the National Coalition for Advanced Manufacturing has proposed a lengthy list of "skill standards" that describe the skills and knowledge that employers deemed most important. These include 27 communication and teamwork skills, problem solving, understanding of workforce issues, as well as math and measurement skills, blueprint reading, and others.

The Department of Labor's 1991 SCANS (Secretary's Commission on Achieving Necessary Skills) Report also indicated that workers for the next century need to be able to read, write, think critically, speak, listen, and be creative. They must be able to make decisions, specify goals, generate alternatives, and solve problems. They must know "HOW to learn, see things in the mind's eye, be able to organize, process, understand symbols, pictures, graphs, and objects" (Secretary's Commission on Achieving Necessary Skills, 1991, p. 3).

The employer expectations of workers, mentioned above, require application of literacy and communication skills that many workers are lacking (Phillipi, 1994). Workers are expected to be able to read operator guidelines and procedures, understand the

mathematical concepts used for SPS (Statistical Process Control) and CNC (Computer Numerical Control) machines, as well as use interpersonal communication skills to interact with other workers, supervisors and also, in some cases, customers. There is a need for workers to know and use social/interactive skills, the so called soft skills which include thinking skills, communication skills and ability to function effectively in groups. Most workers have not had the preparation needed to function in their new roles in the changed workplace.

In conclusion, the workplace is changing. Not only are companies faced with meeting global demands by introducing sophisticated machinery, they must be concerned with upgrading the technical skills of workers to run new machinery and preparing workers to monitor quality, to analyze and solve problems as they work and learn from each other in teams. Team work, collective learning and innovative collaboration demand new skills on the part of the worker. National standards express the unified demand for new competencies in today's workers. These new expectations of workers require effective programs that prepare workers for the new workplace.

Current Company Programs to Prepare Workers Found Lacking

Presently there are programs, such as Tech Prep or the Employee Tuition Assistance Program (ETAP), in large plants that provide classes, often at the worksite, to assist workers in brushing up on basic skills or pursuing college courses or technical training. Also companies may offer training sessions, such as SPC (Statistical Process Control) conducted by an employee knowledgeable about the topic. Some companies contract with workplace educational providers/vendors to conduct programs to address specific needs.

Current programs may address specific basic skills, such as math, or technical needs, and seem to be doing a satisfactory job in this area over the short term, but results are less satisfactory over the long term. Learning time is high for literacy skills, requiring 80 to 120 hours of instruction for a year gain. Retention of reading and writing skills is poor. If these skills are not used, a significant loss of this learning occurs within a few weeks (Follingsbee, 1995; Mikulecky, 1989, 1992, 1995, Mikulecky & Lloyd, 1996; and Royce, 1983). Also little has been written about programs that help workers to acquire the social/collaborative competencies necessary for interacting, learning from each other and effectively communicating with co-workers as well as supervisors. These soft skills are also important in today's workplace.

Many workplace education programs have used instructional approaches that are characterized by traditional, teacher-led lecture style classes, in which high school type materials are often used. Another approach is individual tutoring with SRA type "teaching machine" materials, or individualized computer programs. Although these approaches may have some benefits, there are valid reasons for using a collaborative approach.

Support for Collaborative Approach

In collaborative groups, the emphasis is placed on the active role of the learner interacting with the teacher and other learners instead of just relying primarily on the teacher to transmit knowledge to passive recipients. In collaborative groups learners take responsibility for identifying problems or projects, thinking about alternatives and solving problems as a group, thus taking ownership of their learning (Levine, 1994). Group-type, collaborative learning is supported both by theory and by research. The theoretical foundations that support collaborative learning will be presented first followed by research

and workplace factors that support this approach.

Learning Theory Supports Collaboration.

Collaborative, interactive learning was emphasized by the philosopher, John Dewey and a sociocognitive learning theorist, Lev Vygotsky. Dewey (1938) especially, stressed that learning is more than merely the transmission of information from instructor to student. Individuals learn when they are placed in a context where they are able to explore and reconstruct their understanding of the world around them.

Dewey emphasized the social aspect of learning. He argued that if humans are to learn to live collaboratively, they must experience the living process of collaboration in learning situations. He felt that life in the classroom should represent the democratic process. Collaboration in small groups provides the kind of environment that promotes making choices and carrying out academic projects together. As students learn to relate to one another in group activity, they can begin to empathize with others, to respect the rights of others, and to work together on rational problem solving. (Dewey, 1916)

Vygotsky, as well as Dewey, interpreted learning as a social process. Vygotsky (1962) emphasized the importance of instructor to student as well as student to student interaction in the learning process by asserting that students are capable of performing at higher intellectual levels when they work in collaborative situations with other students than when they work alone. Vygotsky argued that thinking and the use of language develop in attempts to interact with others.

Wells (1992) and Barnes (1975) also emphasize the need for working in small groups in which students learn from each other through interactions in which they talk, discuss, and argue their way through to understanding. This appears to be an effective

method for learning and constructing knowledge. This type of collaboration requires learners to work together, listen to others, to hear each others ideas, to challenge and rethink and reshape ideas.

Others, such as Argyris and Schon (1978), Deutsch (1949), Freire (1970), Kolb (1984), and Lewin (1948), have built on the foundation laid by Dewey and Vygotsky to contribute to the knowledge base of group interaction. They feel that working in groups has distinct benefits for learning. They found that as students took more responsibility for their learning and questioned others in their groups, a deeper level of learning occurred.

Research Supports Collaborative Group Learning

Theory has suggested that more effective learning takes place in collaborative groups. Research provides data that substantiates this hypothesis.

Comprehension improved. Research supports what theory suggests about collaborative learning. Recent studies have indicated that the use of group work and group discussion aided comprehension, that as teachers systematically activated students' backgrounds prior to reading and used various means of enriching the literacy environment, impressive improvements were made (Crismore and Mikulecky 1985).

Higher levels of thinking occurred. Other studies showed there is evidence that social interaction has positive benefits for learning. More critical thinking and learning occurred in situations where students were presented with learning opportunities in which they discussed, argued, criticized, and considered other views (Barnes and Todd ,1995; Crismore and Milulecky, 1985; Gilles, 1993; Harste, Short and Burke 1988; Johnson and Johnson,1989; Slavin,1983; Sternglass and Smith, 1984; Wells, 1992). Although much of this work has been conducted in public school settings, the principles apply to other

settings.

Social skills and student motivation improved. Other benefits have been seen.

Cooperative groups in schools have been effective in promoting social considerations as well as increasing achievement. These benefits include greater liking for school, fellow students and teachers; enhanced inter-ethnic relations; and more acceptance of handicapped students (Johnson and Johnson, 1989; Slavin, 1983). In a study of adult students by Kempt (1995), students who participated most actively were the ones with greatest improvement as well as highest motivation and positive attitude.

If theory and research indicate that collaboration is an effective approach to learning, it stands to reason that collaborative activity should be an important part of the learning opportunities offered to workers. If workers are to take the initiative, develop strategies for solving problems, and develop the social skills necessary to work together, it is important to consider this approach for workplace education.

Workplace Supports Collaboration

Studies have shown that collaboration in workplace groups has been beneficial. Among these are increases in productivity, product quality, cost efficiency job satisfaction and employee morale and motivation. (Dumaine, 1990, Wellins, Byham, and Wilson, 1991) Today in the workplace, there is an emphasis on working together. Team work is encouraged as an effective means of analyzing and solving problems as well as expediting plans from initial designs into final production

Companies have found benefits in collective learning in employee teams which encouraged shared learning and innovations. When employees sense they are valued as resources for the organization, they are more likely to work together for the betterment of

the company. More and more, workers are included in product quality groups to discuss products, problems and ways to improve. Needed, it seems, are workplace classes that use approaches that prepare workers to participate in these collaborative group efforts that are expected in today's workplace.

Purpose of the Study

Collaboration has been an effective approach in public education. This approach should be considered as an alternative to the kinds of classes that currently exist in the workplace. It was the purpose of this study to consider the impact of collaboration on learning, attitudes toward learning, and attitudes of participants in workplace classes.

Research Questions

The primary question that guided this study is: What is the impact of collaboration on learning and attitudes of participants in education programs in workplace settings?

The sub-questions were:

- I. Are there any differences in the learning of participants in classes that have a collaborative approach?
- II. Will students in collaborative classes have more positive views of their own learning than those in less collaborative situations?
 - A. Will students who are in collaborative group situations think they learn better alone or in a group setting compared to students who are in less collaborative settings?
 - B. Will participation in these classes have an effect on students' self perceptions about their ability in reading, writing, math, understanding and speaking English, working as part of a team, and solving problems/using

reasoning?

- III. Will students in collaborative classes have different attitudes toward their class than students who are in situations where the instruction is not collaborative?
- IV. Were there differences in attendance patterns by participants in these three classes?
- V. Will participation in these collaborative and non-collaborative classes have an effect on students' plans to take other courses?
- VI. What effect will the environmental context have on their learning and participation in the class with more collaborative situations as compared to the one with less?
- VII. Is there a relationship between participation in this class and satisfaction with job, job performance, and feelings of being appreciate/respected by supervisor/upper management?
- VIII. What are important factors of collaborative instruction?
 - A. What behaviors that characterize collaborative group work are observed in students and the instructor in the collaborative situations as compared to the non-collaborative situations?
 - B. What behaviors and speech will students say are helpful to them in learning in collaborative situations?

Overview of the Study

This study investigated the use of collaboration within workplace education classes as an approach for learning but also as a means of assisting workers in learning from others, in communicating and participating in group efforts, which is needed for expected

team efforts on the job.

Three workplace education classes with different content and contexts were studied and compared to determine the possible impact that collaboration has on worker's learning and attitudes about their learning and working together. The methods that instructors use in facilitating group collaboration were also examined.

Through close observation of these classes, the speech, behaviors and occurrences of collaboration both between teacher/ student and student /student were observed and analyzed. An attempt was made to determine the patterns of collaborations that emerge naturally among students and those that the instructors initiate to determine strategies that teachers might be able to use in establishing learning environments in which students feel supported in their learning and working together. The fit between what instructors say they believe and what they actually do in a classroom in helping students learn and work in groups also was examined and compared between classes with more collaboration and those with less.

Additionally the relationship between students' learning gains, students' comfort level and satisfaction with what they learned; students' reaction to the environmental context, approach to instruction; learning preferences, taking additional classes, attitudes toward their job satisfaction, perceived support by management, and self perceptions of abilities; and attendance were examined.

Definition of Terms

Collaboration/Collaborative Group Work According to Webster's dictionary, collaborate means "to work together for a common project, especially as it relates to literary, artistic or scientific endeavors." Bruffee (1973) expands this concept to include

the importance of engaging in a process of intellectual negotiation and collective decision making. Dewey (1916) promotes the idea of group (social) involvement, but questions the need for consensus, arriving at mutual agreement, which may cause a sense of conformity to the group. For the purpose of this paper, collaboration/collaborative group work will refer to the active verbal interactions of members of a group with each other and/or with the instructor to come to better understanding. This includes discussion, questioning, arguing, "talking through" to understanding. (Barnes, 1975)

Community For the purpose of this paper, the term community will refer to the sense of belonging, a supportive environment for taking risks in learning, the respecting of each other's opinions, and acknowledging and supporting each other. (Short and Burke, 1991)

Support For the purpose of this paper, support will refer to an awareness of belonging to the group, a feeling that the student's participation in the group is appreciated, that others in the group are glad to have that student in the group.

Behaviors This refers to the physical actions, facial expressions, and body language of the instructor or other students.

Caring This refers to words and actions that show another that others are concerned about his/her well being and that things are going well for him/her.

Speech This refers to exact words to express meaning and feeling that are used by students and instructors.

Attitudes In this study, attitudes will refer to the feelings, thinking, and comfort level that students express in bodily posture, facial expression, and verbal expression.

Participation For this study, participation will refer to active involvement in talking, discussing, arguing, contributing to the dialogue taking place in the classroom, whether

with other students in small groups or with the instructor.

Individual Learning Styles In this study, this will refer to preferences by students to learn by different modes: auditory, visual, kinesthetic.

Previous Learning Instruction For this study, this will refer to the kind of instruction individualized, group, or teacher led - that the student experienced before, either in school or training sessions.

Environmental Context For the purpose of this study, this will refer to the physical and emotional conditions to which the students are subjected, such as room temperature, noise, crowded conditions, and comfort level in the class.

Limitations of the Study

In order to conduct a study in which optimal conditions exist, there would be workers volunteering to come on their own time to learn what they feel is relevant and interesting. Participants in this study, for the most part, were given release time because the company felt it is important for them to learn skills and qualities that will benefit the company. This means that subjects could not be selected based on specific variables. For true collaboration to exist, individuals would make choices as to the topic and materials used. (Dewey, 1938) Use of specific materials, such as operating guidelines, manuals, and other workplace reading materials have been required of all workplace programs, including this one. (Sticht and Milulecky, 1984). This limits the use of articles from magazines, paperback books, newspapers, etc., not related to their work, that would be of interest to adult learners. This limits the potential learning.

Because curriculum manuals have been developed and are expected to be used in the classes observed, collaboration initiated by students was limited. The focus in

workplace education has been to determine needs from the needs assessment, interviews of workers, supervisors and management, and to design programs to address these specific needs. The usual format is teacher oriented instruction or customized computer programs that address individual needs. Again this limits the sense of true collaboration, since the curriculum has been developed in advance to be used in classrooms instead of determining specifically what workers in a particular class feel is of importance and of interest to them and then developing opportunities to facilitate this kind of learning.

Participants in classes are affected by such things as seniority, because of union issues, especially when there is release time paid for by the company. Older workers with seniority, who may soon retire, are given first opportunities to take classes on release time. Often these older workers take all the classes they can to get off the line, leaving fewer opportunities for others who may equally benefit from workplace education classes.

In the companies studied, there are factors that affect the attitudes of students who attend the classes. At one site, only a certain number of workers were allowed off a line at any given time. In another company, the workers were told that they must attend. Workers who attend, under these circumstances, will likely have different attitudes and commitment than those who come to learn, not just to get off the line for a few hours.

This study is limited to only two sites in a large Mid-western city. It does not imply that all work sites will have the same conditions, work issues, and contexts as these workers. Since there was no control possible over the gender, age, race, or ability of the participants, because most were volunteers, this should also be seen as a limitation.

Significance of the Study

This study was designed to determine the impact of collaboration on the learning

and attitudes toward learning in workplace education class participants. The effect of these factors on learning, and things that instructors use to facilitate collaborative and community sense is applicable wherever adults are being educated or "trained," whether support staff at universities or hospitals or students for teacher education. The need to learn by working together benefits not only the individuals in a learning group but also the larger organization.

It is important that workers have the necessary skills to meet the demands of the changing workplace. Therefore, it is necessary to provide the very best instruction possible in workplace settings. This study provides information that can help instructors of adult workers to provide more effective opportunities for learning in supportive environments in classrooms in the workplace. In addition, this information can be used for other urban adult learning situations, both in the workplace and in other programs.

Preview

The remainder of this study consists of the following: In Chapter 2, the relevant literature will be addressed. The procedures for conducting the data collection and analysis will be presented in Chapter 3. In Chapter 4, the process, problems and results of the study will be presented, and in Chapter 5, the study's data results will be discussed, limitations and considerations for further study will be provided and implications for instruction will be presented.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter will explore the literature to determine from a business and an education perspective, the possible benefits of using collaboration as an instructional approach with workers in the workplace education classroom. Little has been written in the literature regarding workplace programs that emphasize collaborative group work. Yet, more and more workers are expected to have the communication skills and problem solving capabilities to function in teams. This chapter will look at collaboration, its place in education, its philosophic basis, its model and supporting research as well as why collaboration should be considered for workplace education with adults.

The following review of literature is related to two aspects of this study: (1) The rationale for using collaboration as instructional approach with adults in workplace education classes. This includes the philosophic basis, research that indicates its effectiveness and benefits, and a working model of collaboration. (2) The rationale for using collaboration in workplace education. This includes the fit with workplace needs, a review of current programs and recommended adult education practices

Educational Support for Collaboration

Collaboration has been advocated by theorists who see benefits for students participating in interactive activities in a social context for enhanced learning. Those who have influenced collaborative educational theory are primarily proponents of experiential learning such as philosopher John Dewey , sociocognitive learning theorist Lev Vygotsky, and social psychologists such as Kurt Lewin and Morton Deutsch. An overview of their theoretical positions will follow.

Learning Theory Supports Collaboration

Experiential learning proponents, such as Dewey and Vygotsky emphasize the position that learning is more than transmission of information from instructor to student. They maintain that individuals learn best when placed in a context in which they are able to explore and reconstruct their understanding of the world around them (MacGregor, 1990) It is not enough for instructors to "pour knowledge into empty vessels". Students must experience through interacting with elements in their environment. Piaget emphasized cognitive development through experiential learning as knowledge is constructed as an individual process. By contrast, Dewey and Vygotsky interpreted learning as a social process. Lev Vygotsky, (1962) a developmental theorist and researcher, who worked in the 1920's and early 30's, influenced some of the current research of collaboration among students and teachers and on the role of cultural learning and schooling. One of his principal premises was that human beings are products not only of biology, but also of their human cultures. Intellectual functioning is the product of our social history, and language is the key mode by which we as humans learn our culture. He emphasized learning through verbal interaction with others.

He also believed it is through language that we organize our verbal thinking and regulate our actions. He noted that children interacting toward a common goal tended to regulate each other's actions. In such tasks, dialogue consisted of mutual regulation. Together, they were able to solve difficult problems they could not solve working independently.

He stressed the importance of instructor-student interaction as well as student-student interactions in the learning process. He maintained that students are capable of

performing at higher intellectual levels when working in a collaborative situation than when they work alone. He provided the groundwork for educational theorists who maintain that language use and thinking develop as students attempt to interact with others.

Based on this view of learning as a social process, this study will examine the verbal exchanges of adult students in the workplace to determine the kinds of interactions taking place to determine which, if any benefits of these verbal exchanges occurred.

John Dewey also emphasized the social aspect of learning. He stressed collaborative, democratic living in the learning context. He argued that if humans are to learn to live collaboratively, they must experience the living process of collaboration, especially in classrooms. He felt that it is more important to prepare students for life in society rather than just transmitting knowledge from teachers to students. For this reason, he emphasized the need for the democratic process to be realized in the classroom through collaboration in small groups. This provides an environment where such a process can occur, because the setting encourages students to make choices and carry out beneficial academic activity together. As students learn to relate to one another in group activity, they begin to empathize with others, to respect the rights of others, and to work together to solve problems.

Dewey's thinking influenced a consciousness that began to evolve within instruction in public schools. Teachers became aware of the need to guide events in a learning setting toward working together and building understanding. This approach to instruction involved setting up guiding principles to govern effective group activity that would lead to students' mental and social development as well as academic achievement. This instructional consciousness is especially appropriate for adult education. In adult

This instructional consciousness is especially appropriate for adult education. In adult education, instructors facilitate student learning not merely with subject matter competence but also with the ability to function as a group member, learning from and with each other.

Given the importance of considering social aspects of learning, this study examined social benefits, to determine what ones, if any, occurred during the working together in small groups. One area of focus was the attitudes of students toward others they have worked with in small groups.

Brazilian educator Paulo Freire (1970) made significant contributions to the concept of collaboration. He felt that knowledge was not something that could be just transferred from the teacher to the student so this knowledge could be memorized and given back to the teacher. He felt that to really know something, the individual learning had to include action, critical reflection, curiosity, and demanding questioning. He also emphasized the need for teacher and student to learn together, as opposed to the teacher acting as the authority.

He emphasized the need to listen and work together for understanding. He is also known for his ideas about consciousness, especially as it applies to participants. He wrote that consciousness involves awareness of one's own experiences and observations as they relate to others who have had these same experiences. He emphasized the importance of examining others' experiences for their influences as well as learning about the ways in which one's experiences are similar to others or unique. (Freire 1970)

Learning with and from others was important. Freire emphasized the importance of dialogue. He felt that dialogue was part of what it means to be human, that humans are essentially communicative. He felt that there was no human progress without dialogue.

He insisted on the necessity of dialogue as a teaching strategy. Individuals need to listen to what others have to say. This study will examine students' responses to determine if they have benefited from experiences of dialogue with others in their group.

Dewey, Vygotsky, and Freire have contributed to the foundational support of collaborative learning. This next section looks at others who have built on ideas of those mentioned above and added support for collective learning.

Social Psychological Theory Supports Collaboration

Social psychological theory has contributed to collaborative learning theory. Kurt Lewin investigated and developed issues of group functioning, building on Dewey's ideas. Lewin was a pioneer in the study of group dynamics and initiated knowledge about the underlying dynamics and nature of group life. He dealt with interrelationships within groups when developing his field theory. This theory suggests that the essence of a group is the interdependence among its members. Interdependence means that the group functions as a dynamic whole so that a change in the state of any member or subgroup can cause changes in the state of any other member or subgroup. (Lewin, 1948) His field theory is based on the idea that behavior is the product of a field of interdependent determinants (known as social space). Lewin maintained that these dynamic properties of the field are represented by psychological and social forces that produce a state of tension within individuals. This tension motivates a drive to accomplish goals, whether cooperative, competitive or individual. This consideration provided the basis for much of Johnson and Johnson's (1991) research on achievement.

Lewin identified and defined three different forms of interdependence: (1) positive (cooperative), in which the goals of individuals are linked, and (2) negative (competitive) in

which the occurrence of one reaching his/her goal is detrimental to the others and (3) the individualistic mode, in which only the individual's goals are considered, the others don't matter. Cooperative interdependence is beneficial for group efforts. In order for cooperative group work to be effective, individuals within the group must be led to assume responsibility for their own learning, but they also benefit from the interactions that provide the best opportunity for learning. Cooperation benefits individuals working together.

Learning and social psychological theory support collaborative effort. These field theories suggest what the benefits should be, but it is necessary to look at actual research findings, in which cooperative efforts have been used in classrooms, to determine the benefits of group-type learning.

Research Supports Collaborative Learning Benefits

Since this study has investigated the impact of collaboration on learners, it is helpful to review research studies of collaboration in classrooms. Theorists discuss the reasons why collaboration should work. Here the benefits of collaborative group work for learners, according to educational research, will be discussed. Several studies have been conducted looking at the impact of collaboration/cooperative learning.

Achievement and Increased Learning. David and Roger Johnson conducted several studies that involved achievement data for both primary and secondary students of varying abilities and ages and in a wide variety of curriculum areas. These studies, in which they compared competitive to cooperative to individualistic situations, typically lasted 3 weeks.

Groups were randomly assigned assuring equal numbers of boys, girls, majority and minority students, high, mid, and low ability. The mix in groups also included mild to

severely handicapped students. Also considered were other factors that might affect the conditions, for example, they included students from every grade including college levels. They used curricula in math, English, language arts, geometry, social studies, science, physical science and physical education. Teachers involved in the studies received 90 hours of training on how to implement all three situations (individualistic, competitive, and cooperative). Teachers were rotated across conditions to prevent advantages of teaching ability. To assure the validity of the results, field studies were combined with laboratory studies. Experimental and survey studies were also used.

In the cooperative groups, students shared work, discussed materials, explained to each other what was not understood. Students were responsible for their own learning and that of their peers. There was a sense of interdependence, in which students cared about and committed to each other's success as well as their own.

From these studies, the researchers found considerable evidence that cooperative learning experiences promote higher achievement than do individualistic or competitive approaches. They found that cooperative groups provide settings that more closely resembled society in general and encourage informal discussions that lead to critical and creative thinking processes and ultimately higher achievement.

Out of twenty-six studies they conducted, there was evidence of significantly higher achievement in twenty-one of the twenty-six studies. Of the remaining five, two had mixed results and three found no difference.

Johnson, Maruyama, Johnson, Nelson and Skon (1981) conducted a meta-analysis of 122 studies on cooperative learning that had been conducted from 1924 to 1981. By using three methods of analysis (voting method, effect-size, and 2 score methods) with

these studies, they found that cooperative learning experiences promoted higher achievement than did individualized or competitive learning experiences. This was true for all students and all subjects.

Robert Slavin (1983) has also done extensive research in the area of achievement. In classroom instruction, small groups composed of high, low and middle achieving students with ethnic and background mix were given a learning task that all had to learn because a combined score of all the students in the group was compared to their previous score. The group with the highest percent of improvement was rewarded. Participants who participated in cooperative groups achieved more than students working alone. Recognition was given for improvement as well as highest score, encouraging students in the groups to help each other work toward their goals.

In all, Slavin conducted or reviewed 46 field experiments in elementary and secondary schools in which achievement was targeted. These studies, which lasted from 2 to 16 weeks, involved control groups studying the same content. Of these studies, 29 involving small group work favored achievement, 15 found no differences and 2 favored the control group. Factors favoring achievement were student accountability within the groups and high group reward. It was found that students encouraged and helped one another to learn.

These studies have found that small group interactions increase the opportunities for active learning and substantive conversation, which are important components for learning. Nystrand, 1986 and Slavin, 1983 found support for using class time for group learning, which produced higher levels of achievement than traditional (lecture) techniques. Argyle (1976) suggested that peers share similar cognitive constructs and

communicate more easily with each other than with the instructor, thus increasing learning from and with others.

Barnes and Todd (1995) also found benefits for verbal interactions of students in their learning. These researchers observed classes of average students in two high school classes at the outskirts of a large industrial city in England. These classes had a wide range of subjects: social studies, English, physics, biology, history, and geography. The researchers tape recorded the small group discussions, which occurred at the point that the teachers felt that group work would be beneficial to the students' learning. They predetermined the context of the discussion by talking to the teacher prior to the taping. Also students had task cards on which instructions were typed. The researchers talked informally with the students, had students research the tasks from the cards, turned on the tape recorder and left the room. The students turned off the recorder when they were finished.

The conclusions of this study indicate that school students of average ability can work together in small groups to good purpose, engaging with tasks set by the teacher and carrying them through to completion. More importantly, this study showed that students can develop and use a complex array of collaborative competencies, as well as social skills, to achieve a joint exploration with greater understanding of topics at hand. "The dialogic articulation and interrelation of different points of view which is the crucible of learning becomes a real possibility in group discussions such as these" (Barnes and Todd, 1995, p 54).

Wells (1992), Barnes (1975), and Gilles (1993) also have found substantial benefits in providing opportunities for students to work in small groups. By allowing students to

"talk their way to understanding," students were able to think aloud, clarify their understanding through interacting with peers and were more proficient in understanding concepts and in using them for class presentations (Barnes 1975).

One of the benefits of discussion in small groups is the learning opportunities in which new insights or new combinations of ideas are constructed. These are the associations that remain in the long term memory. (Maltese, 1991) This kind of learning is "owned" by the students, not forced on them by outside experts. This is an important consideration, since learning retention is a concern of adult educators.

In another study, Palinscar and Brown have applied Vygotsky's theories about dialogue to classroom instruction. They reasoned that if the natural dialogue that occurs outside of school between a child and adult is so powerful for promoting learning, it ought to promote learning in school as well. They were interested in finding out if dialogue between adults (teacher) and students could encourage self-regulated learning.

Their classroom research revealed increased self-regulation in classrooms where, subsequent to training, dialogue became a natural activity. Within a joint dialogue, teachers modeled thinking strategies, encouraging students to feel free to express their uncertainty, ask questions and share their knowledge without fear of criticism. As this process took place in a number of classrooms, students freely discussed what they knew about topics, often revealing misconceptions. Teachers could then help students change their misconceptions through continued dialogue (Palinscar et al., 1984).

Cooperative learning, "working together to accomplish shared goals," (Johnson & Johnson, 1989, p 2) has resulted in higher group and individual achievement, higher-quality reasoning strategies, more metacognition (self monitoring of thinking processes),

and more new ideas and solutions to problems. In competition, students benefit from failure of others, whereas in cooperative groups, peer relationships are more lasting, there are better social skills, more social support and higher self esteem (Johnson and Johnson, 1975).

An example of cooperative learning took place in Joliet, IL, a community of diverse backgrounds. Students in the Joliet West High school experienced a high failure rate and high rate of referrals for discipline problems. The school instituted a cooperative learning program that provided all freshmen opportunities to experience small-group cooperative learning. These cooperative learning opportunities included such diverse settings as gifted students, special education students, problem solving seminars, shop classes, and mediation and arbitration. The results were impressive. Students earning grades in the A to C level increased by 20 percent. There has been a significant reduction in the number of failures among the academically at-risk group. There were fewer disciplinary referrals on the freshman level. Students were forming their own groups to study before major tests. Student comments indicated that they really liked working in groups and felt that group work had helped them solve problems and figure out new ways of dealing with issues (Tinzmann et al, 1990). In addition to the achievement benefits, there were also the social benefits from working together.

Social Benefits: Positive Attitudes and Enhanced Self Perception Several studies indicate that participants in cooperative group efforts have better attitudes towards school, learning, subjects, themselves, and others in their groups. When they had a better attitude toward school, students were more likely to learn more and seemed to enjoy what they were doing. Exchange of ideas and perspectives was more stimulating and led to examination and

consideration of new ideas. Students had more positive attitudes toward others in their group, regardless of their diversity or ethnic background. Also, they were more adept at resolving differences (Cooper et al. 1980; Johnson and Johnson, 1981, 1984, 1989).

Participants in cooperative groups had healthier processes for deriving conclusions about self worth. They were more likely to relate self acceptance and positive self evaluation as related to attitudes toward cooperative situations. (Noren-Hebeison and Johnson, 1981) Participants in collaborative efforts tend to view accomplishments as a result of their efforts within a larger collaborative effort (Bird & Brame, 1978; Bird, Foster, & Maruyama, 1980; Garibaldi, 1976). Thus participants, within collaborative settings, tend to attribute success to personal, recurring, and controllable causes rather than to luck. (Johnson & Ahlgren, 1976).

Group work situations promoted care and respect for others, positive peer relationships and ways to communicate ideas. Students who participated in cooperative groups felt liked by classmates. They wanted to see their classmates succeed. They were able to see and understand other perspectives more easily. Peer support and feedback were important elements of social interaction (Tinzmann et al, 1990).

Of 14 studies that Slavin conducted, all but 2 showed improved intergroup relations. This included improved race relations, better liking for fellow students, and positive attitudes towards students in their group who had physical handicaps (Slavin & Hansell, 1983). Involvement in cooperative groups has been helpful in mainstreaming students in the public schools.

Several studies have indicated the positive attitudes and improved self perception of students involved in group work. Not only did these students have more positive attitudes

toward their school work, they were more accepting of others different from themselves, whether these differences were because of race or physical handicaps. Students who worked in groups also had more positive self evaluations, suggesting desirable social benefits of interactive group work.

Motivation Successful collaborative efforts often include greater achievement and productivity, which enhances students' motivation and overall sense of self-esteem, control, and competence (Johnson, Johnson, Pierson & Lyons 1985). In addition, students working in cooperative groups tend to be more intrinsically motivated and intellectually curious, as well as caring of others, and psychologically healthy (Tinzmann et al, 1990).

In a study by Kempf (1995) in which three classrooms of young adult students were observed, the classroom that had the most active group participation resulted in higher student learning, most improved writing skills and a more positive attitude among students. This classroom had gains in motivational scales used by the researcher, suggesting that interpersonal interaction and support of group work affected them positively. Collaborative group work seems to have benefits of increased learning, resulting in higher achievement, enhanced self perception, supportive peer encouragement, and higher motivation to learn.

A study by Glasser(1986) also indicated higher motivation brought about by peer support. As high school students worked in teams, not only did they raise their achievement levels with greater retention but their motivational levels to learn increased.

Summary for Benefits of Collaboration In conclusion, there seems to be much support for collaborative learning. (Figure 1) Theoretical foundations provide support for the way students learn best. Social psychological theory adds to this support. Research studies on

collaborative group learning provide examples of the benefits of interactive learning such as higher achievement, higher quality reasoning, motivation, peer support, sense of belonging, and ownership of learning. Since this study will be examining the impact of collaborative efforts in the workplace classroom, it is useful to know of the benefits of collaborative work that other studies have found to serve as a possible checklist for this study.

Benefits of Collaboration	Manifestations	Studies
1. Increased learning and achievement	<ul style="list-style-type: none"> -students used creative ways to show mastery -increased understanding of ideas by explaining to others -misconceptions changed through dialogue -more self monitoring of thinking skills -higher quality reasoning -committed to each other's success as well as own 	Featherstone, 1976; Johnson & Johnson & Holubec, 1990; Nystrand, 1986; Slavin, 1983; Tinzmann et al, 1990
2. Positive attitudes toward schooling	<ul style="list-style-type: none"> -improved attendance -improved behavior -more positive toward school, subject areas, and teachers 	Cooper et al, 1980; Johnson & Johnson, 1981, 1983, 1987; Slavin, 1987
3. Development of leadership skills	<ul style="list-style-type: none"> -able to understand perspectives of others -able to communicate ideas 	Johnson & Johnson, 1983, 1989
4. Enhanced self perception/ positive attitude	<ul style="list-style-type: none"> -attribute success to personal, recurring, and controllable causes rather than luck -promoted healthier process for determining conclusions about one' self worth -low achieving students can make contributions -perception different for "loner" than cooperative participant 	Bird & Brame, 1978; Bird, Foster & Maruyan, 1980; Cooper et al, 1980; Garibaldi, 1976; Johnson & Johnson, 1981;
5. Improved attitudes toward others	<ul style="list-style-type: none"> -fewer stereotypes of individuals of another race -liking of those worked with -improved relationships between students and other students in group/class -caring for others 	Slavin, 1980; Tinzmann et al, 1990
6. Motivation	<ul style="list-style-type: none"> -support provided by peers 	Glasser, 1986, Kemp 1995
7. Improved social skills	<ul style="list-style-type: none"> -provides positive interdependence on others -developed interactive skills -more able to resolve differences 	Johnson & Johnson, 1989

Figure 1 Collaboration Benefits

Model of Collaboration

This study investigated the amount of collaboration and the impact on learning and attitudes that takes place in workplace education classroom settings. It is therefore necessary to acquire a working knowledge of collaboration: what it is, what it is not, what it looks like in a group, what are the teacher's and students' roles, the kinds of behavior and speech likely to occur.

What Collaboration is Like

A collaborative might be thought of "communities of people who learn to think together through mutually exchanging ideas and maintaining intellectual dialogues" (Short and Burke 1991). It might also be thought of a process of shaping meanings that most likely would not have been reached alone. Barnes and Todd (1995) provide informative benchmarks as to the essential ingredients in collaboration, or as they would call it "talking through to understanding," which include exploratory talk, group support and reflection. Short and Burke (1991) add the need to build mental connections between self and the world seen so as to understand and fit in missing areas in one's understanding of the world. These features will be discussed in turn.

Exploratory Talk. Barnes and Todd (1995) consider "exploratory talk" to be a beneficial aspect of collaboration. In small groups, students can engage in dialogue with others, communicate their own viewpoint, and consider what others have to say. They can try out new ways of thinking and reshape ideas in mid-stream, if necessary, and respond immediately to hints and doubts of others in the small group. This interaction and exploration of ideas helps to clarify the learner's existing understanding or stimulates new understanding. Short and Burke (1991) maintain that as an individual borrows from others

experiences and understanding, he/she still maintains his/her own new voice as new understanding is being created.

Group Support. The support of others in a small group is important because it is necessary to be able to explore, reshape, or incorporate diverse ideas. In a supportive small group, one can more easily risk hesitation and confusion, change in direction and rejection of ideas by others in the group. There is a comfort and sense of binding together as risktakers as individuals confer, compare, and contrast options. There is a sense that the risks taken are cushioned by the support of the group, who are also risktakers (Short and Burke 1991).

Reflection. In addition to exploratory talk and group support, reflection plays an important role in collaboration. Reflection gives reasons for what is done, even if it is wrong. There needs to be reflection, reasoning behind solutions or ways of thinking. As individuals reflect, they become aware of the variety of logical solutions available. They are more likely to see beyond surface situations to look for conceptual likeness and use these understandings to transfer to other situations. This enables more ownership of learning, not just dependence on authoritative voices (Short and Burke, 1991).

Extended Focus. Short and Burke (1991) offer some other features of collaboration. Besides the shared commitment of a cohesive group of learners who engage in dialogue, support, and reflection, it is desirable to have an extended focus. The group should continue to explore and refine ideas over a long period, not just convening for short, specific objectives to be reached. Short and Burke emphasize the value of diversity because it increases the resources available. Different individuals bring unique perspectives that make the active process of sharing and retrieving beneficial. As members actively listen and think together, they try to understand and make use of the diverse perspectives.

Role of Group. Another feature of collaboration is the function of roles within the group. Roles are generated by the needs of the project and filled as needed. Members can move in and out of the "teacher" role as they interact with others. All are seen to have potential, not limitations, as they contribute to the new understanding generated.

Inquiry as Focus. The focus of the group is inquiry, not final solutions. Short and Burke (1991) feel that consensus which depends on commitment, valued diversity, equal value of contributions, blind roles, and shared vulnerability is more beneficial than fixed solutions. This involves exploration, dialogue, give and take to create new knowledge and understanding that goes beyond any individual member's ability alone. Instead of final answers, they generate current best solutions.

In summary, the collaborative model features are: exploratory talking in which dialogue is maintained allowing ideas to be exchanged and reshaped, supporting of others in order to take risks, reflecting on reasons below the surfaces, and valuing diversity so learning takes place both from others as well as with others. Another important consideration of collaboration is that the process of inquiry is more important than final solutions. Significant learning and personal development take place in the process of working together.

What Collaboration is Not

Teacher-led discussion, on the other hand, should not be confused with collaboration. With this type of discussion, it is unlikely that exploratory talk with a class of 20 or more would occur. More likely, in teacher-led discussion, students will respond with "interjections or brief assertions", giving answers to satisfy the teacher that they were listening. In this type discussion, there is more likely to be competition in answering

correctly and fear of failure. Also, it is difficult for even the most skilled teacher to gain access to the individual student's everyday experiences and /or discontinuities that may interfere with productive trains of thoughts that lead to understanding.

In *The Human Condition*, Arendt (1958) expresses the need for human beings to appear before others, to have a public image, as if to connect themselves to others. Small groups provide these "spaces of appearances," which are not as plentiful in teacher-led classes. Students usually feel more comfortable speaking before their peers and participate more often than in a large class. Likewise they are likely to be more honest and speak more freely than before the whole group.

For successful learning to take place, the teacher needs to help the students to understand what kind of understanding is necessary. Students need to make their thinking "public" in order to help them achieve greater "explicitness" and self awareness in learning. Students need to relate new information, new experiences, new ways of understanding to their existing understanding. Just listening to the teacher is like "expecting the learner to arrive without having traveled"(Barnes and Todd 1995, p 17). (See Figure 2 for continuum of teacher-led to student-directed learning.)

What Collaboration Looks like in a Classroom

In considering what collaboration looks like in the classroom, it is important to look at the role of the teacher/instructor, the participants, and the group. Following are characteristics of these three elements. These elements provided benchmarks for this study in examining the learning activities and behaviors that transpired in these workplace classrooms. (See Figure 3)

Types of Instruction						
Code/label	L	L/Q	ILD	ILSP	TLG	SLC
Type	Lecture	Lecture/questions	Teacher-led discussion	Teacher-led student pairing	Teacher-led group work	Student-led collaboration
Description of learning situation	Teacher-led instruction	Teacher-led instruction with questions directed to students	Teacher-led instruction with discussion between teacher with students, and students with students	Teacher directed pairing of students to work together with specific teacher expectations	Teacher initiated group work with broad teacher expectations	Student initiated collaboration with topic of their choosing
Teacher role	Teller	Teller/questioner	Teller/Guide	Guide	Guide	Facilitator
Type of questions	No questions	Closed questions	Open questions	Student-generated questions along teachers guidelines	Teacher and student generated questions	Student-generated questions
Type of expected response	No expected response	Pre-determined responses expected	Teacher evaluated responses	Expected evaluated responses	Teacher has broad expectations for what results will be and guides thinking toward those responses	No expected answers: teacher facilitates thinking, but does not guide to predetermined answers
Example of learning situation in workplace	Teacher lecture on history of quality control	Teacher lecture on SPC (Statistical Quality Control) with specific questions to determine students' comprehension	Teacher initiated discussion about the need for quality control in products students use. Teacher asks students to give examples and tell when they expect certain degree of quality in products and services.	Teacher assigns students to work in pairs to read selection on topic and ask each other questions about the selection.	Teacher divides the students in groups and presents a situation, such as quality problems at their plant. Students work together to list problems and possible solutions. They prioritize possible action steps.	Students, on their own, get together to discuss problems with the type food offered in the vending machines. They analyze the problem, discuss possible solutions and decide what action to take.
Evaluation:			Responses evaluated by teacher	Teacher evaluates participation and responses	Teacher evaluates participatory/thinking and general understanding	Teacher evaluates process/thinking
Teacher perspective		Teacher asks specific questions to determine students understanding				
Student perspective		None	None	None	Students confirm from sharing	Students confirm from sharing

Figure 2... Continuum of types of learning from teacher-led to student-led

Characteristics of Roles in Collaboration

Teacher (T)

- co-learner/inquirer
- “mid-wife” to the inquiry (Reed, 1985 p235)
- question asker to clarify students thinking
- encourages participants to explore and figure things out to discover meaning
- facilitator of student interaction
- encourages social skills of participants
 - listening to others, taking turns

Participant (P)

- one who:
 - actively participates in his/her own learning
 - reflects upon what he thinks-stands inside and outside of event at the same time
 - brings own unique perspective to group
 - shares experiences and deals critically and creatively with experiences
 - questions others participants and/or teacher
 - exists in a state of constant growth - observes, questions, makes connections
 - explores and takes risks in trying out new choices
 - provides reasoning behind selected solutions, actions, or ways of thinking
 - reshapes thoughts and feelings through talk
 - reworks ideas held in a vague and/or ill defined way
 - relates new information, new experiences, new way of understanding to own existing understandings

Group (G)

- Collective sounding board of and reactor to ideas -public forum for ideas
 - intermingling and focusing of contributions from members of group
- Community of learners/inquirers who:
 - shows respect and tolerance of others
 - works cooperatively with other
 - urges each other to push deeper and harder into issues
 - creates meaning from collected dialogue
 - make available wide ranges of resources, including the thinking, experience, help and encouragement of other group members

Figure 3 Characteristics of Roles in Collaboration

The Teacher's Role

The teacher's role in collaboration is quite different than in the traditional classroom. In a collaborative setting, the teacher is a co-learner and inquirer, not the expert with all the answers.. In the community of inquiry, the teacher and student relationship is based on a "kind of scholarly ignorance," (Reid et al, 1989, p 235) each concerned about figuring things out to discover meaning. The teacher moves in and out of groups, often as participant and other times as facilitator of focused thinking and reasoning. That is not to say that the teacher plays no important role. The teacher, in a real sense is a facilitator and helps students to make sense of their experiences and information. The teacher asks questions to help clarify individual or group reasoning and thinking. She/He encourages certain sorts of discussion by asking questions to help participants become aware that certain issues or topics seem to have a logical priority over others. She/He is also a resource to participants and/or consultant. The teacher monitors group activity and at times calls the whole class together for clarification or correction of misunderstanding or for presenting facts or skills as tools to further the inquiring. The teacher assists in the construction of meaning and has been called the "mid-wife "to the inquiry (Reid et al, 1989, p 235).

In the more structured setting of cooperative learning, the teacher takes a more active role in the students' learning situation. The teacher carefully plans for small group activity, building on what student's already know. She or he helps them develop a clear sense of direction in their group time, provides time for the group to develop their understandings and for making their findings public (Reid et al, 1989, p 43). The teacher may help the students to set goals, find needed information, be a good listener as a

consultant, and set reasonable deadlines for group activity. The teacher unobtrusively monitors group activity, being aware of what is going on in each group, and helps students to clarify thinking or tighten their reasoning by asking relevant questions. Whether it is a cooperative or collaborative group, the teacher moves in and out of groups, either as equal group participant or monitoring facilitator.

Role of Participant

The individual participant in a collaborative group is valued for his contribution to the group. He/She comes with a unique perspective because of his/her unique set of experiences and background. Each participant, regardless of ability, makes valuable contributions.

The participant takes an active role in his/her own learning. The learner observes, explores, questions others (including the teacher) and seeks to make connections between new information, new experiences, and new ways of understanding to his/her own existing understandings. He reflects upon what he is learning, like standing inside and outside of an event at the same time (Short and Burke 1991). The participant “looks out to see what is happening” and seeks to build mental connections between self and the world. He/She is drawn to incomplete/flawed “yet to be understood” areas that demand to be completed/understood. He/She works at this puzzle until a working solution is found. Through talking with others, he/she reshapes thoughts and feelings and reworks ill defined or vague ideas(Short and Burke 1991).

Role of Group

Although the group can be thought of as a public forum for ideas, where thinking can be made public and new understanding and knowledge generated, (see Figure 3)

groups are not static. Groups are flexible organizations that serve the need of the learners. Often there is a home group, which is the working group in which students normally operate. It is in this group that most activity begins and provides a secure and supportive base from which students can venture out and return. Students that start in a home group can easily work individually, in pairs or even move on to form a wide range of others groups as they investigate needed information or confer with other students as peer resources. There can be different configurations of groups that occur at any point in time, as different needs arise. There is also a sharing group to which students can publicly direct the results of their findings. Of course there is the whole class for times when everyone needs to hear needed information or corrections. Students can move in and out of groups as needed. They can seek information at any time in any way that suits them best from the teacher, texts, references, or other students.

Essentials of small group work include the sharing of common purpose and to collaborate to joint ends. Types of interactions that might be observed in small groups working collaboratively are shown by the examples evident in the discussions of these small groups in the Barnes and Todd study. (See Figure 4)

Examples of Group Participant Interactions

The following examples were taken from transcripts of recordings done for Barnes and Todd study:

1. initiating discussion of a new issue
2. qualifying another person's contribution
3. implicitly accepting a qualification
4. extending a previous contribution
5. asking for an illustration to test a generalization
6. providing an example
7. using evidence to challenge an assertion
8. reformulating one's own previous assertion (p 28)

Some of the social functions that were evident from the group work were:

1. obtaining information from others
2. completing unfinished utterances
3. encouraging others to contribute
4. inviting others to contribute
5. repeating with modifications
6. supporting the assertion of another with evidence

Figure 4. Examples of participant interactions

Summary of Collaboration

Theorists for education and social psychology have discussed the reasons why collaboration should benefit students in the classroom. Research has indicated that collaboration has indeed been beneficial to students in achievement, increased learning, motivation, positive attitudes toward school and learning and attitudes toward others. A look at collaboration, with the role of teacher, participant and group, provides benchmarks by which to compare the data from this study.

Business Perspective for Collaborative Learning

In this chapter, thus far, collaboration as an effective instructional approach has been supported by theory and research. What needs to be considered here is whether or not it would be a viable approach to use in workplace education. First of all, the needs of the workplace will be presented to see if this approach would be a good fit for the kinds of learning that prepare workers for the challenges of the new workplace. Then the kinds of workplace programs that have been tried will be reviewed. Finally, a review of practices that reports and research indicate are beneficial for adults will be presented.

Needs of Workplace

Because of the changing workplace, companies are facing issues that magnify the need for effective workplace education. High performance workplaces that can compete with foreign markets need skilled workers that are competent, informed, committed individuals who can meet the demands made upon them, not only in work production but also as contributing members of the total work community. The emphasis on team effort heightens the need for workers who can effectively interact and communicate ideas with those around them. Many workers lack a “sense of community” in the workplace. Often

they come to work and do their boring tasks without a sense of belonging, feeling valued, or connected to the organization. Workers need to feel part of a community in the workplace, something which might be provided by the classroom environment.

Collaboration, working in small “communities” could be utilized to meet this sense of community. The following discussion will address business concerns that support the need for collaboration in a community of learners in the workplace.

Needs that Arise Because of the Changing Nature of Work

Changes in the workplace are creating new expectations of workers. To meet these expectations, many workers will have to understand what is required and enter into a mode of learning and retraining. U. S. businesses are struggling to re-establish the pre-eminence they once knew. Global competition has made companies aware of the need to bring in new technology and to build high performance workplaces in an effort to catch up to their foreign competitors. Most U. S. companies are beginning to learn that flexible, high performance work systems are made to work by empowered, involved, highly skilled workers who not only can use machines equipped with the latest technological advances but who can also make decisions and take responsibility for these decisions. Businesses across the nation are redesigning their organizations and are beginning to give thought to redesigning their workforce (McVey, 1995).

Among other changes, many companies are beginning to implement Total Quality Management (TQM) systems practices in order to achieve the efficiency levels necessary for remaining in business and for competing on the global market. To make production/service processes more profitable and efficient, many organizations are beginning to consider shifts in responsibility, resulting from downsizing; establishment of

cross functional, self-directed teams; upgrades in sophisticated, technological equipment; and assurance of quality through collection and analysis of product statistics by teams or departments (Phillipi, 1994).

Needs Represented by High Performance Workplaces

Concerns about the declining ability of the U. S. workers to compete successfully in international markets prompted the U.S. Department of Labor to issue The Secretary's Commission on Achieving Necessary Skill (SCANS) Report. Since this report came out in 1991, organizations have been urged to become "high performance workplaces." This may mean different things to different organizations, but the general consensus suggests that it refers to descriptors such as "high skills, high wages," self-managed teams, restructuring, re-engineering, reinventing. To understand what is expected of workers in these worksites, it is important to examine the most common characteristics of high performance workplaces, as determined by Byrne, 1993; Galagan et al, 1992; Marshall, 1992; and SCANS 1991. The high performance workplaces are characterized by:

1. flatter, horizontal structure instead of vertical hierarchy - more impact and responsibility by lower levels (not just management and mid levels)
2. Work done by teams organized around processes; teams empowered to make decisions so management is decentralized
3. Empowered workers with high skill levels and cross-training; rewards for team performance
4. Collaboration among teams, between labor and management, and with suppliers
5. Focus on customers, quality, and continuous improvement

6. Flexible technologies

AT&T, Eastman Chemical's Kodak, GTE, and Saturn are examples of companies using high performance practices. It is estimated that one-fourth to one-third of U.S. companies have made some kind of high performance change, for example, Chaparral Steel.

Chaparral Steel is an example of an effective high performance workplace of today. Every employee is salaried, there are no favors for management such as special parking spaces or dining rooms. Everyone is considered a vital contributor to the total. Everyone learns everyone else's job; so there is continuous flow of information and involvement throughout the industry. Everyone is considered a salesperson for the company and has opportunities to deal with customers. New ideas and opportunities for experimentation are encouraged. There is a "no fault" attitude for failed attempts. There are no special rewards for new ideas carried out, except the satisfaction of it being done. There is no research and development (R and D) department. Development takes place on the floor. Miniature models of equipment on the factory floor allow workers to try out new processes or procedures before utilizing expensive full sized equipment. Everyone is involved and ideas are shared. Facilities, such as locker rooms in the plant are designed to encourage interaction. The whole plant is considered a learning lab. Its innovative outlook and outstanding production, profits, and low turnover of employees are proof that effective learning from each other in a supportive community/culture can be beneficial.

Needs of Workers in High Performance Workplaces

It is uncertain whether most companies will achieve the high performance status, but the consensus is that workers should be prepared for them. Workers need to be able to

create, extend and apply knowledge; have sophisticated skills; be adaptable and flexible, and be able to work in teams of diverse people.

McVey (1995) presents the characteristics needed in today's workers. He emphasizes the need for empowered, involved, highly-skilled workers who not only can use machines equipped with the latest technological advances but can also make decisions and take responsibility previously undertaken by bosses. Workers are needed who can cooperate with others to solve problems and implement change. They need to be able to conceptualize, organize, verbalize thoughts, resolve conflicts and work in teams. Collaboration in small groups would help workers learn the social skills and interactions needed for effective team work.

Work in many organizations is more likely to mean manipulating information than raw materials. The vast majority of jobs require individuals to interpret, analyze and/or synthesize information. Originally it was only at the top levels, but now this is true at all levels. Rather than employees learning in preparation for work, they must now learn their way out of the work problems they have to deal with.

Formerly workers were taught a specific task and set to doing it, and managers were responsible for following the procedure workers were taught, more or less as a control task. Now workers at all levels have to interpret, analyze and synthesize. "Learning is no longer a special activity that takes place before one enters the workplace or in a remote classroom. To put it simply, learning is the new form of labor" (Zuboff 1988, p395). In her book, *In the Age of the Smart Machine*, Zuboff considers ability to make meaning and exercise critical judgment as the organization's most precious resource. She states that the organization's investment in upgrading and maintaining those skills is comparable with that

of investing in technology. Gordon et al., (1991) writes, "The fundamental resource of any economy is people."(p. 29)

The U. S. Department of Labor, issued The Secretary's Commission on Achieving Necessary Skills (SCANS) report in 1991 on the competencies, skills, and personal qualities needed to succeed in a high performance workplace. Areas focusing on desired worker competencies are:

1. Resources...Identifies, organizes, plans, and allocates resources
2. Interpersonal... Works with others on teams, teaches others, serves clients, exercises leadership, negotiates, and works with diversity
3. Information...Acquires, organizes, interprets, evaluates, and communicates information
4. Systems.....Understands complex interrelationships and can distinguish trends, predict impacts, as well as monitor and correct performance
5. Technology... Works with a variety of technologies and can choose appropriate tools for tasks

The foundation skills and qualities that competent workers need in high-performance workplaces are the following:

1. Basic Skills - reading, writing, arithmetic and mathematics, speaking and listening
2. Thinking Skills - the ability to learn, to reason, to think creatively, to make decisions, and solve problems.
3. Personal Qualities - individual responsibility, self- esteem and self-management, sociability, and integrity (SCANS, 1991).

The report recommended that these competencies be learned in the context of the environment in which they will be applied. These competencies are needed because of the changing nature of the workplace of today and of the future. High performance workplaces demand that workers have the necessary basic and technical skills but also the thinking and collaborative skills needed to interact with ideas and others.

It would seem that small group collaboration would help prepare workers for these kinds of expectations, especially with the interactions, the self-esteem, and ability to work with others of diverse backgrounds.

Community-Sense Needed in the Workplace

Many organizations are realizing that for productivity and employee satisfaction to exist, employees need to feel that they belong, that they contribute to the whole of the organization. Many organizations have taken an interest in what is called the learning organization for reasons such as improving quality, managing change, energizing a committed work force, avoiding decline, and enhancing customer relations. One important focus for employees is making the time at the worksite more than just putting in time and then living one's real life elsewhere (Watkins & Marsick, 1993).

The focus of learning organizations is to make the workplace a community in which individuals can learn with and from others in a community of learners. The following statements suggest some basic beliefs about the learning organization (Senge et al., 1994). In a learning organization:

1. People feel they're doing something that matters to them personally and to the larger world.
2. Every individual in the organization is somehow stretching, growing, or

enhancing his capacity to create.

3. People are more intelligent together than they are apart. If you want something really creative done, you ask a team to do it - instead of sending one person off to do it on his or her own.
4. The organization continually becomes more aware of its underlying knowledge in the hearts and minds of employees.
5. Visions of the direction of the enterprise emerge from all levels. The responsibility of top management is to manage the process whereby new emerging visions become shared visions.
6. Employees are invited to learn what is going on at every level of the organization, so they can understand how actions influence others.
7. People feel free to inquire about each others' (and their own) assumptions and biases. There are few (if any) sacred cows or undiscussable subjects.
8. People treat each other as colleagues. There is a mutual respect and trust in the way they talk to each other, and work together, no matter what their positions may be.
9. People feel free to try experiments, take risks, and openly assess the results.
No one is killed for making a mistake. (Senge, et al., 1994, p. 51)

There is an increasing interest in learning organizations in the workplace.

Individuals in an organization should be thought of as "in relationship to", not "in the service of" the organization. Often organizations may engender alienation in employees by encouraging dishonesty and distrust through competition. Individuals spend most waking hours in some kind of an organization. Therefore organizations should be places that

hours in some kind of an organization. Therefore organizations should be places that support workers as worthwhile individuals who can learn with and from others and, at the same time, contribute to the well being of the organization. The workplace educational class is one place where this sense of community might exist, where collective thinking can take place.

It is important to emphasize the concept of learning how to learn in organizations. Bruner, in *Process of Education*, (1962), writes that learning how to learn is perhaps as important as learning specific knowledge. Workers of today and tomorrow have to learn how to learn. Thurber once said, "In times of change learners shall inherit the earth, while the learned are beautifully equipped for a world that no longer exists."

Some examples of companies which have implemented changes through practicing learning organization principles are Harley-Davidson, Motorola, Corning, AT&T, and Fed Ex. Ford's Lincoln Continental division broke product development records, lowered quality defects, and saved millions by using these practices. Chaparral Steel has 80% of its workforce in some form of educational enhancement at a time. They produce steel in much less than the national average, 1.5 employee hours instead of the national average of 6 (Solomon, 1994; Watkins and Marsick, 1993). Companies have realized benefits from using these practices.

An important aspect of the learning organization is the attempt to break down the separation between the personal and work lives of employees, moving away from the clock in, clock out mentality, or the "eight and skate" attitude. Since time at the workplace involves a sizable chunk of a workers' life, it is felt that the workplace should be a place where self fulfillment could be realized.

Johnsonville Foods started a "journey" toward such an end. The owner of the company was interested in developing a focus on the customer, to get the workers more involved and committed to the company, to make it fun for them. To focus on getting people responsible for their own performance, the owner felt that learning was the best way to realize this goal. The theory was that people who are learning would be more open to change. Their personal development coordinator provided opportunities for people to get into "a learning mode." Several individually based learning programs were offered, \$100 was provided to each member to use for learning to take a class in anything he/she wanted to learn. Workers were given the opportunity to spend time examining personal inventories, their goals and the company direction. They also could spend a day with any other employee of the company to see beyond their own jobs as to how their work impacted the product and customer. Interestingly enough, learning began to spread and individuals were using what they were learning at the workplace.

At Johnsonville Foods others saw the value of learning together to achieve better results. Teams began to form themselves. At first people worked on issues other than work related, such as problems with the food vending machines. Later groups expanded their efforts to include cross functional work teams that addressed issues that impacted more than one department. If an issue arose, the first thing their people did was to determine who else it might impact. They got that group, or representatives of it, together to solve the problem. New situations became opportunities for learning and growth. This kind of employee involvement, sense of belonging and commitment in organizations help to address the need for sense of community in workplaces. If companies value the benefits of collected thinking and reasoning, it stands to reason that this approach should also be

included in workplace education classrooms.

Conclusion for Business Perspective for Collaborative Learning

In conclusion, from a business perspective, there is a need for workers in high performance workplaces to become active, learning, and sharing members of the total organization, able to function as participating members of their work community. The emphasis on learning and employee participation in teams, that is evident in many organizations already, should be considered in preparing workers to fully participate in the changing workplace. Workers need to learn how to learn to keep up with the demands. They need to be able to effectively interact with others, whether other workers, supervisors, or even customers. They need a sense of belonging, a sense of appreciation, and confidence as to how they fit into the big picture at work. Learning the needed skills is important, but the approach used could help prepare them in ways other than just academic. Collaboration has much to offer workers in workplace education classes.

Inadequacies of Current Work-Related Programs

To understand the need of education in today's workplace and the kinds of programs that benefit workers, it is helpful to look at existing programs and how these are meeting workers' needs.

Current Workplace Literacy Programs

To address the large gap between the skills needed in the workplace and those that a large proportion of young adults, especially from minority populations lack, the government has responded by passing the National Literacy Act of 1991, with funding for the National Workplace Literacy Program (NWLP). Following are discussions about programs that have been instituted in workplaces to address the literacy needs of workers.

First of all, it is necessary to look at what is meant by workplace literacy. Workplace literacy is literacy tied to workplace knowledge. Meltzer et al (1993) write about workplace literacy as including the three R's but also focusing on skills such as communicating, learning how to learn and team-play. Following is a discussion about these programs.

Who Participates? The groups most likely to be deficient in workplace literacy include high -school drop outs, unwed mothers, and those with high arrest histories. These categories correlate well with race, class, and ethnicity . These workers or job seekers also have the lowest levels of document, prose, and numeracy skills (Kirsch, Jungeblut, Jenkins, & Kilstad, 1993).

Why Put Programs in the Workplace? Because a majority of those lacking literacy skills have jobs, it makes sense to situate literacy programs in the workplace. It might be argued that workers would be more motivated to learn and more likely to take in needed content when it is connected to their work. According to the studies made among military subjects by Sticht, Armstrong, Hickey, and Caylor, (1987), the non-literate could be made productive when training is held in close connection with the jobs they will perform. Lave & Wenger (1990) and Resnik (1977) concur that there are discontinuities between school cognition and learning beyond the classroom. According to Sticht, et al, and Lave and Wenger and Resnik (above), a worker with limited reading skills could more easily learn to read an electronics manual, than a novel.

Sticht (1978) feels that there is a clear relationship between reading ability and the reported use of reading skills, especially to read something useful. He identified two basic kinds of reading tasks: reading to do and reading to learn. Diel and Mikulecky (1980) found that workers could read job related materials at higher levels than their tested grade

levels. Sticht and Mikulecky (1984) found that reading of job-related materials was more likely to lead to reading level gains than general reading. If workplaces are appropriate places for classes to be offered to workers using work related materials, it seems important to consider what should be included in these programs.

Problems with Current Programs One of the most prevalent problems with current programs is the lack of retention of learning. Milulecky (1989) writes that there is significant loss of learning within a few weeks if there is no practice of the learning that occurred. This is one of the arguments for using work-related materials in the workplace classroom since workers would have more practice using them on the job.

Another problem is the amount of time for learning gains. In literacy learning, it takes 100-120 hours to improve one year in general ability. (Milulecky, 1989) Most programs are 20 to 50 hours of instruction. This is not sufficient time for long term literacy gains to take place. Many of the literacy needs of workers cannot be addressed in shorter lengths of time.

An additional problem is that transfer of learning to new applications is severely limited. Often students cannot put into effect what they have learned because of a time lapse or lack of connection between what is learned and what the worker does on the job. Sticht (1982) found that general literacy education did not transfer to job application. He felt it was important to use a "functional context" approach.

Another problem that exists in workplace education classes as well as adult education classes is the high drop out rate. Often workers have strong negative feelings due to previous experience with educational systems (Rigg and Kazamek, 1983).

What Programs are Expected to Include There are strong feelings that literacy

programs should be linked to the literacy skills required on the job and be evaluated accordingly. Some workplace literacy evaluators feel that the development of good workplace programs should include literacy audits that feature systematic study of the worksite. This includes close examinations of work samples, inspection of job descriptions, task analyses, and building of political support (such as collaboration of unions) (Mikulecky, Henard, and Lloyd, 1992).

The trend within the U.S educational systems seems to emphasize competency-based education, making it possible to work toward occupational standards and certifications. For this type program, competencies or skills required for a given occupation and the observable and measurable criteria for competency are carefully identified and verified by expert workers from business and industry who are currently employed in the occupation. Melton (1994) feels that such occupational standards require certain recommendations, such as giving attention to the role of personal motivation in worker achievement of established standards and expecting performance to be included in the measuring of the skill. Higher-order thinking skills that allow transfer of knowledge and skills in other contexts and applications should be addressed. Self-development needs of the individual should be considered as well as those of the industry.

Summary of Current Work Programs

In conclusion, many workplace education programs have been developed that were to address the skills gap between what workers lack and what companies say they want workers to know. Some authors in the field have emphasized the use of context-based materials and direct application of learning. National based efforts, such as SCANS have indicated the kinds of learning that should be included in classrooms for workers. Others

feel that programs that help workers to actualize themselves as individuals should be used.

All feel the need for addressing the needs of workers in the workplace. How these programs should be presented to the workers is another matter. The most effective approach that addresses the workers' needs, fits with workplace expectations, as well as being worker friendly, should be considered.

Effective Workplace Education Practices and Trends:

Included in the literature are indications that certain characteristics tend to be more effective than others in classrooms for adult workers. Following are some of the findings about these types of classes.

Beyond Basic Skills. In case studies on five work sites, (Hilbert,1992) the one most effective program addressed areas other than basic skills. The instruction at this site included journal writing, class discussion, and peer tutoring. The manager of the site noted that, while he expected students to improve academic skills, he also learned that self-esteem and basic skills benefited the company by reducing employee turnover and absences. Others feel that literacy should include more than the basics and should include opportunities that enhance workers as individuals and lead to self actualization, allowing for full participation in democracy (Gowen, 1992; Greene, 1991; Kazemek, 1991; Saemiento & Kay, 1990).

Participatory Emphasis. In *Workplace Literacy: Emerging Directions in Program Development*, Imel (1995), describes a trend toward a more participatory or collaborative approach to workplace literacy. The importance of involving workers in the design and development of programs is demonstrated in such publications as Perin (1994) and Freeling (1993). Others, such as Jurmo (1992) and Waugh (1992) emphasize the inclusion

of participatory activities, such as learners working as a team to identify problems and solve them, and learners serving as facilitators and resource persons. O'Neil and Marsick also wrote about using group activities to develop critical reflection skills, and Folinsbee (1995) emphasized the need for a collaborative, holistic, and integrated approach to workplace education.

Summary for Effective Workplace Practices and Trends

In addition to considerations for workplace education, such as going beyond basic skills, cooperative learning and participatory practices, it is important to review what has been learned from adult education, since workers are adults learning in a classroom situation.

Current Adult Education Practices

Since workers are adults, it is important to look at practices that apply to adult learners.. First it may be helpful to examine practices that failed to meet students needs.

Problems in Adult Education Programs

Failure to meet Students' Needs. Most adult education programs do not meet the needs of adults. Most programs for adult learners are teacher oriented with the learners as passive recipients of knowledge dispensed by the expert, the teacher. Many take the format of GED type classes, with the use of many work sheets to address the needs of students. Individualized programs, especially drop in programs on a volunteer basis, may use computer based materials, like Plato, which are much like sequential, mastery oriented learning machines or SRA lessons. Learners can proceed at their own pace. This may be useful for shy individuals who are embarrassed about limited skills.

Treating Learners Like Children. When adult learners were asked about the kind of

learning experience they preferred,(Watson & Lovelace, 1979) they said they did not want more of the same typical classroom instruction they negatively experienced as children. They wanted to use reading and writing as a means of engaging in social interactions with their peers.

Likewise, in a Job Corps program, Rigg and Kazemek (1983) reported that treating the young men involved in this program like children had a detrimental effect, not only on their learning but also on their perception of themselves. Instead of an effective learning atmosphere, this program "fostered an atmosphere of solitary learning and a lack of mutual concern and support." This was due largely because of the nature of the individualized master programs used. Participants proceeded through the worksheets of short passages and questions and then moved on to workbooks with more of the same. The teacher's job was basically that of a monitor.

When asked about their reading abilities, participants indicated that they just followed through what was given them instead of learning new strategies, thus confirming their inadequacies as readers. These participants felt there was something wrong with them because they had failed to learn by using the same old methods that were used in reading labs in school. They had become passive, dependent learners who doubted their reading abilities and their own intelligence as well (Rigg and Kazemek,1983).

When the program was changed to include materials these men were accustomed to reading such as newspapers, current magazines, interesting paperback books and to include writing letters to family and friends at home, they developed a different attitude toward learning. Group settings were established to encourage interaction. Students worked together carrying out and evaluating learning activities. As a result, they were able to

improve basic skills, but more importantly, they felt better about themselves and often chose to continue ways to improve themselves through other classes. Use of relevant materials as well as treating adult students as adults brought about effective changes.

Retention. There is also the problem of a high drop out rate in adult education classes. Although there are often psychological, sociological, and educational factors involved, it would seem that programs often do not meet the needs of the adults who most need them. Kazemek (1991) suggests that well meaning teachers "assume the role of a kindly family physician," who tries to find out what is wrong with the adult learner and prescribe a "cure." After diagnosing the "deficiencies," these are treated by assignment to one or more sets of skill packets. The teacher decides what the adult needs to know and how the adult can best learn it. In this way, the student often feels a lack of ownership in the learning.

High Learning Time. Learning time is high for adults to make a grade gain. Sticht (1982) conducted studies with military personnel. He concluded that a grade level gain in reading takes enlisted men from 80 to 120 hours of instruction. In an adult reading program in Louisville, Kentucky, it was estimated that 70 hours of instruction were necessary for a grade level gain (Darkenvald, 1984). In this program a combination of counseling, individualized instruction, functional goals and group dynamics produced faster gains and lower attrition rates.

Because the learning time is high for significant improvement, this has negative effects on both learners and evaluators of these programs. Learners are often hoping for a quick fix and become discouraged when they have not made the gains they had hoped for. Program evaluators often question the effectiveness of the programs when dramatic

improvements are not achieved within a 10 week period.

Even though there are problems in adult education programs, such as programs that don't meet students needs, adults feeling they are being treated like children, lack of retention, and high learning time required for gains, there are some practices that have been effective with adult learners.

Recommended Adult Education Practices

After considering problems with adult education, it is now important to consider adult education practices that should be considered for workplace education.

Appreciation of Student's Experience. Curriculum and course content should support a more inclusive environment. Termed "new pedagogy" by Taylor and Marienau (1995), this way of teaching is more inclusive and incorporates the validity of the student's experiences as well as support for the emerging self as a focus of education. Also emphasized is the contextual nature of knowledge- the relationship between the learner and his or her knowledge base. This new pedagogy includes such practices as reflective journal writing, role playing and small group discussion.

Adults Appreciated as Adults. Differences between teaching adults and children are looked at by Imel (1989). She suggests that even those who say they believe in using an andragogical approach, an adult-friendly approach, they often do not actually do so. Knowles (1982) suggests that workplace programs will not be effective until they recognize the adult nature of these students and practice what he calls "andragogy", the art and science of helping adults learn.

After the end of WWI, in this country and Europe there was a growing body of notions about the unique characteristic of adults as learners. Dewey was concerned with

how adults learn. Even in 1926, Lindeman felt that the approach for adults should be through situations, not just subjects. It was felt that curriculum should be developed around adults' needs and interests. It was felt that the learner's experience was a resource of highest value and that learners learned from each others. The best approach was "small groups of aspiring adults who desire to keep their minds fresh and vigorous; who dig down into the reservoirs of their experience before resorting to a text and secondary facts" (Lindeman 1926, p. 8).

Knowles stressed the fact that adults differ from the child in having more individuality and more social purpose. Adult learning makes special allowance for individual contributions from students and seeks to organize these into some form of social purpose. Knowles feel that one cannot teach another person directly, but only facilitate his learning. Learning has to be relevant to the learner. Experience can be assimilated if the learner is relaxed and his mind is expanded to include it (Knowles, 1982). Learning is often threatening to an adult individual. There is a real need for a supportive and accepting climate with heavy reliance on student responsibility for his/her learning. A supportive group context is important for learning, especially for adults. Effective practices and principles for gearing learning to adult learners should also be considered in providing workplace education.

Empathetic/Enthusiastic Instructors. The most frequently mentioned attributes that adult learners expected of effective instructors were: to show concern for student learning, to emphasize relevance of class material, and to be enthusiastic. They wanted teachers who created a comfortable learning atmosphere (Donaldson, Flannery, and Ross-Gordon, 1993).

Small Groups. Because literacy is a social skill, small groups more accurately reflect the contexts in which adults generally use literacy skills (Binham et al, 1990; Ennis, 1990). Writing and talking about personally meaningful events provides learning through active communication processes in the social community of the classroom. Small groups are more conducive for incorporating personal experience.

Advantages for small groups with adults includes the following:

Small groups allow for integration of critical thinking and other language processes.

- Small groups create opportunities for learners to experience and observe the learning of others. This permits learners to expand their repertoire of learning strategies.
- Small groups break down the isolation and stigma often experienced by adults with insufficient skills and provides peer support for learning.
- Small groups enhance self esteem by appreciating what learners have to offer as a result of their experiences.
- Small groups make available a wide range of resources, including the thinking, experiences, help and encouragement of other group members (Imel, 1992).

Supportive Environment. It is important to consider the motivational aspects that influence adult learners. Adults with limited reading abilities often experience anxiety and have negative concepts of themselves as learners. They need to be supported in an environment where taking risks in learning is encouraged, where it is all right to make mistakes and take chances.

Beder and Valentine (1990) suggest that the reason adults participate in programs is

classes is "a vestibule activity, a logical first step, which once undertaken, enables participants to both logistically and psychologically make changes in their lives."

Sometimes adults have been out of the learning cycle for such a long time, they want to try it out to see if they can handle it. It is a big step for them. It is important for them to be supported in their efforts.

Summary of Effective Adult Education Practices

In conclusion, effective practices, such as treating adults on a different basis than children, appreciating the experiences they bring, building on their prior knowledge, providing enthusiastic instructors, and utilizing small groups that can provide supportive environments should be included in workplace education classes. This leads naturally to the nature of this study, to examine in workplace classrooms the practices, behaviors attitudes exhibited to determine, if possible whether collaboration is an effective educational practice to use with adult learners in the workplace.

Summary for Chapter Two

Collaboration has been shown to be an effective instructional approach for learning. Theorists have advocated the benefits of collaboration and research has confirmed their theories. Research has shown the many benefits of collaboration, such as increased learning and motivation, development of leadership skills, enhanced self perception and attitudes towards others. Students in public schools have benefited from collaborative experiences. This same approach to learning should be as effective with learners in the workplace environment.

As demands are increasing in the workplace for more competent workers who can effectively participate in teams for assuming responsibility for higher product and service

effectively participate in teams for assuming responsibility for higher product and service quality, it is important to consider effective approaches to workplace education. The needs of workers as adult learners need to be understood and programs developed that support learners as valued resources who can learn with and from other learners.

Because of the benefits of collaborative learning, it is important to recognize the social nature of adults as learners and to consider group based learning in which benefits of increased achievement, higher levels of thinking, skills for social interaction, and more positive attitudes might be possible. These benefits that have been seen in other learners might also be realized for adult learners in the workplace.

CHAPTER 3

PROCEDURES

This study focused on three workplace education classes, two collaborative in approach and one traditional in approach. It sought to determine how the behaviors and patterns of speech that characterize collaboration affect the learning, attitudes, and self-perceptions of students toward their own learning, their perceptions of job performance, team work and problem solving. First the population from which the two classes came is discussed along with a preliminary description of each class setting, then the methods used to study these classes including data collection and data analysis.

Population and Sample

The three classrooms under study were located in two dissimilar companies in a large metropolitan area in the Midwest. All three classrooms were located in a highly industrial populated area. The first classroom (A) was located in a large manufacturing company which produces axles for one of the big three auto companies. Classroom B and C were located in a small manufacturing site that produces flywheels and oil pan covers for automobiles.

Subjects

The students for all classes were mostly hourly workers who attended classes. Classroom A students attended on a voluntary basis, but students of Classrooms B and C were required to take the classes. Workers from these two sites received support from their companies in attending classes. Students from all three came to class on release time, which was paid by the company.

Classroom A. The population from which the students from Classroom A came consists of 1739 hourly workers from 7 divisions within the plant. The racial composition of these hourly workers is approximately 35.6% Caucasian and 64.4% minority population, including African American, Lebanese and other. There are approximately 74.5 % males and 25.5% females of the hourly workers in the plant. Workers in this plant are mostly middle age with an average age of 39.7. They range in age from 19 to 70 years. There are 15 % age 18-25, 38% age 25-40, 47 % age 41-60. Workers on the average have worked approximately 10 years at this same plant, with a range from 5 days to 40 years. The number of these workers who have finished high school is not available, since that information predated computer input. Tests given to new hires since the late 1980's require a high school diploma. At the time most of these workers were hired, there was no formal entrance test given. Very few of these workers have English as a second language. There is a small population with Lebanese as the primary language in the home.

In this particular class (Math for Machine Operators), there were 7 hourly workers, three of whom were females. There was one Caucasian, one Lebanese, and the rest African American. There were two males in their 20's, two males in their late 50's with the others with an average age of 40. There was a range of work experience from an half year to 30 years. Two participants had attended some college, two hadn't finished high school and the rest had a high school diploma or GED.

Classrooms B and C. The population from which the students for Classrooms B and C came consists of 280 hourly workers from two areas of labor distribution, primarily assembly and press operation. The racial composition of these workers is 80 % Caucasians and 20% other, including African American, Asian, Lithuanian, and Slovakian. There are

approximately 87% male and 13% female hourly workers at this site. The average age is 42 with a range of 19 to 76. There are 6% in the age group 18-25, 44% age 25-40, and 51% over 40. These workers have worked an average of 10 years at this plant, with a range of .5 -52 years at the plant. Eighty percent of these workers have finished high school. There are very few workers for whom English is a second language. This plant has been testing new hires for only 3 years, so many were not given formal entrance tests.

In the Classroom B, Interpersonal Communication class, there were 14 participants, two from management and the rest hourly workers. There were three females, one of which was from Human Resources. There were three African Americans, two Slovaks, and the rest Caucasians. The average age was 40, with two males nearing retirement. Two had attended college and most had finished high school.

In the Classroom C, Statistical Process Control, there were eight students all of whom were males and team leaders in the plant. There were two African Americans, one Lithuanian, and the rest Caucasians. These participants had an average of ten years of experience and an average age of 40 years . Two had attended college and the rest had finished high school or had a GED.

Description of Classes

- Classroom A. Math for Machine Operators (MMO) This class was open to any hourly worker but primarily targeted those workers who operate or will operate CNC (Computer Numerical Control) machines that cut gears or pistons for the axles produced at this plant. Even though these machines do the work, the operators need to make minute adjustments from time to time to assure parts being cut properly. This class was offered to provide an understanding of concepts, such as decimals, positive and negative numbers,

Cartesian coordinate system, locating axis, and calculating averages and ranges, that are used in operating these machines.

Classroom B. Interpersonal Communication and Problem Solving (IPC)

Although this class was open to management as well as hourly workers, the majority of the participants were hourly workers. Because this company recognizes the need for employees to communicate effectively with each other and management, all employees will eventually take this class in interpersonal communication. At this time, the Human Resources director arranged for one whole line to take this class at one time on release time, so that all these employees who work together would have a better sense where others are coming from when they communicate with each other.

Classroom C. Statistical Process Control (SPC) This class was composed of hourly workers who serve as team leaders from the production lines on the plant floor. These workers have been selected as team leaders by the individuals on their lines. Because of the emphasis on quality by the line teams, these team leaders were required by Human Resources and the production manager to attend this class.

Settings

Classroom A. Classroom A was located on the second floor of the plant nestled in with three other classrooms, which were built recently to accommodate learning needs of workers. Also located on this floor are offices of quality control personnel, the general manager of the plant, and other persons in management. Classroom A was a small room with nine computers, set up in three rows, to accommodate nine workers.

Classrooms B and C. Classrooms B and C were located up the stairs at the rear of the press operation section of the plant. When the nearest presses were operating, the noise

level was high, making it difficult to hear in the classroom. This 13' x16' room, which had recently been painted, contained four tables and 24 individual chairs. At the time the tables were arranged touching each other in an open box configuration. There were two boards for writing on the front wall, one long whiteboard and a smaller blackboard. An easel and overhead projector were also along the front of the classroom. High windows with vertical blinds were on the back wall. An air conditioner was midway along the left wall. A long ledge ran the length of the left wall, which held a telephone, some old gauges, a wooden box and other miscellaneous items. There was a small adjoining room along the right side of the classroom, which was formerly a store- room that was cleared out when classes were begun at this site. This room contained a filing cabinet, a few chairs and some big envelopes with papers in them spread along a wide ledge along the back windows. Since there was no heat or air conditioning in this small room, it was not the most comfortable room in extreme cold or heat.

Methods of Instruction

Classroom A (MMO) Classroom A met for two hours per day, twice a week, for ten weeks. Typically this class met on Wednesday and Friday, 8:30 - 10:30 A.M. Most of these workers learned their jobs by observing or being told how to do the particular job. Many of these workers lacked basic skills in math, especially, understanding of decimals which is necessary to effectively operate the CNC (computer numerical control) machines that are now being used. The curriculum for this class was developed to address this need. This class worked with math concepts and used a computer program as part of the curriculum. The curriculum guide for Classroom A was based on traditional instruction using an interactive computer program, custom designed for teaching the mathematical

concepts needed for operating the CNC (computer numerical control) machines that are used at this site. This particular computer program was newly developed and was still in the process of needed adjustments. The instructor for Classroom A was a large, tall African American male, who had experience teaching part time in inner city schools, but is not a certified teacher. He had taught GED classes in the adult education program in this large city school district.

Classroom B (IPC). Classroom B met two hours per day for two days per week for ten weeks. Typically, this class met from 9:15 - 11:15 A.M. This class was organized to include interactive activities that helped participants to open up and share, build trust, and learn effective ways of communicating. Classroom B's curriculum guide included many activities to help participants feel comfortable with each other, while addressing hindrances to communication. Resources for this class included two videos, charts, handouts and objects necessary for the activities. The instructor for Classroom B was a petite African American female, who has had experience conducting training sessions for social agencies, but she is not a certified teacher.

Classroom C (SPC). Classroom C sessions met for 10 weeks for 1 hour (1:40-2:40 PM) every Tuesday and Friday. The instructor's manual included activities for connecting foundational concepts of Statistical Process Control with previous knowledge that students bring with them to the class. The format for the sessions included class discussion, individual activities (such as charting) and group or paired work. The instructor, who was the same as for Classroom A, primarily used the blackboard and handouts as resources.

Methods of Conducting the Study

Weekly visits were made to each classroom for the full class period for the 10 weeks the class was in session. During these sessions, every effort was made to blend in with class activities so that students would not be uncomfortable with the observations made of them. When appropriate, I participated in activities so they accepted me as a normal part of the class setting (Spradley, 1980). Also efforts were made to talk with each student and get to know them informally, so each felt comfortable during interviews. During this time careful observations of what transpired in the classrooms were made, noting behaviors, timing of activities, reactions of workers, atmosphere, and instructional strategies as well as incidental interactions between instructors and students and students with students. Data collection included field notes, interviews, surveys, class summaries and interviews, pre-post tests, questionnaires, and attendance sheets.

Field Notes. Field notes were taken from observations at each site. My observations began in an Interpersonal Communication and Problem Solving class at a small manufacturing plant. I attended 17 of the 20 sessions that lasted two hours each. This class was held in an upstairs classroom which was suspended over the part of the plant that held huge presses which pressed oil pan covers and fly wheels out of huge rolls of steel. This was a noisy process and it was often difficult to hear what was being said across the room. I always got to the class before the students so I could greet them as they came in. I sat at the back of the room in a chair with an attached arm so I could write notes, which I could flesh out later. The students sat at the tables that were arranged in a U formation. They didn't seem to mind that I was observing and recording what went on in the class.

The second class I observed was the Math for Machine Operators class, which was held in a computer room at a large industrial plant. Space was rather tight in this

classroom so I circulated among the 9 participants while they were working on the computer portion of the session and then wrote notes when the instructor worked with them as a group. They seemed receptive of my being there and were glad for the individualized attention I was able to provide, if the instructor was busy. I attended 11 of the 20 sessions. Each session lasted 2 hours. A strike at the plant interrupted the class sessions for a month.

The third class was a Statistical Process Control class that was provided for the team leaders at the same plant as for the first class. It was held in the same classroom but with a different instructor. The instructor was the same as the one in Math for Machine Operators. Since there were only 8 participants, and some knew me from the Interpersonal Communication and Problem Solving class, I was accepted and any recording I did in class did not interfere with the class proceedings. Since the class was underway before I came to observe, I attended 9 of the 15 sessions that this class met.

Although I took detailed notes during each session, I fleshed out these notes when I got to my computer and added other details as I relived the sessions in my mind. The original forms which had columns for recording the time and instructor's and participant's responses or behavior were very useful in reconstructing what transpired in the session as well as keeping track of the amount of time spent on individual activities. The field notes included what I heard, saw, experienced, and thought as well as descriptions of the students, instructors, activities, conversations, and materials used. Ideas, strategies, reflections, hunches, and any patterns that emerged were recorded. (Bogdan and Bilken, 1982)

Interviews - Students. For the closing interviews with the first class, I interviewed the students in an adjoining room in which I had set two chairs next to each other with a tape recorder positioned so I could catch every word spoken. I explained the reason for tape recording the interview, to expedite the interview so I could give full attention to the interviewee. I asked if tape recording the interview would be a problem. Each participant was asked to sign a consent form, Appendix B, and were made aware of the use of the tape recorder, with the condition that the tapes would be destroyed, once the needed information was obtained. Students could refuse to have the tape recorder used or could turn the tape recorder off at any time, which happened in the case of two participants from the IPC class, who preferred not to have the interview recorded so they could speak more candidly about situations in the class. They were assured that their privacy would be respected. All names were changed in transcriptions to protect the identity of participants. Students were reassured that any information used would be kept confidential (Spradley, 1979).

Individual interviews, using the questions found in Appendix A, were held with each participant, tape recorded, and later transcribed. These interviews were used to determine students' reactions to the class, whether their expectations were met, their reactions to the type of instruction provided in the class, and to group-type participation, and their feeling about belonging in the group.

Instructor Surveys and Interviews. Before the beginning of instruction, each instructor completed a survey on instructional practices. This survey, included in Appendix C, was used to determine the instructors' beliefs and attitudes regarding their perceptions of effective teaching methods and student learning considerations. A close-out interview with each instructor followed the filling out of the survey to make certain their

philosophy was clearly understood, as well as any changes that might be evident. (See Appendix D for interview questions for instructors) This interview were tape recorded, transcribed, and analyzed.

Pre-Post Tests. At the beginning of each course, pre-tests (called previews) were given to the students. Customized tests, developed by the organization providing the instructional service, were given. These tests were designed to check students' understanding of the course content and objectives presented during the 10 week course. (See Appendix E) At the end of each course, the same tests, called reviews, were again given to the students to determine learning gains.

Questionnaires - Students. At the beginning of each course, students filled out a Participant's Enrollment form and the Learner Expectation Summary (Appendix G) to indicate what they wanted to learn in this class. This Learner's Enrollment form provided information regarding students' self-perception of abilities, attitudes toward supervisors, attitudes concerning previous training received and job performance. At the end of each course, each student completed a summary to indicate what they learned from the course, and a course evaluation form. They also completed a Learner's Assessment form, similar to the Enrollment form on which students ranked self perceptions, attitudes and feelings about job performance, and supervisors, as well as their plans to take additional classes. (See Appendix F) The class reaction surveys provided information about students' feelings about the instruction, instructor, course, resources, and conditions.

Attendance Sheets. Students signed in attendance sheets at the beginning of each class session. These were checked to determine retention in the class.

Data Analysis

Both during the study and more thoroughly at the end, the data collected were analyzed, broken down into more manageable components for study and searched for emerging patterns. A systematic search was made for important categories relevant to the area of study. A constant comparative method was used throughout the study as part of an emergent effort to understand (Glaser and Straus, 1967). As I observed and collected data, I was interested to see if any patterns would emerge that would help me understand how these students felt about participating in the class and what factors influenced them most in learning.

I began with the transcribed interviews to look for possible patterns. Each transcribed interview was coded for identification of the participant, class attended and the question answered. These interviews were then cut up into the smallest meaning units. Sometimes it would be part of a sentence and sometimes several sentences that dealt with one topic. The smallest units, parts of a sentence, were glued or taped onto index cards for easy handling.

I then read each individual item and tried to determine what each piece was saying that could help me understand the student's attitude about the learning experience. The first time I read them and sorted them, I tended to categorize them according to the questions asked, since I had developed and asked the questions. The second time through, I tried to let the content of the items speak for themselves, as Spradley (1979) suggested for ethnographic inquiry, to learn *from* these subjects in this particular "culture." The items seemed to fall rather naturally into the following categories:

- Attitudes students brought with them into class
- Their reaction to the class activities and instructor

- The effect of having taken the class
- Their attitude toward working with others in the class
- The effect of the workplace on their attitudes

To determine validity of these categories, an independent rater was asked to also sort all the items into categories. The results were fairly similar. Some items could be taken for more than one category. The percentage of agreement for the categories presented the following results:

- Attitudes students brought with them into class - 76%
- Their reaction to the class activities and instructor - 86%
- The effect of having taken the class - 61%
- Their attitude toward working with others in the class - 80%
- The effect of the workplace on their attitudes - 57%

Since I had written a code on the back of each item before the independent party did the sorting, I was able to quickly find the differing items. I sat down with the independent party and asked for her reasoning for placing the item in a particular category. As we talked, it was easy to see that some of the items could easily be selected for more than one category, such as the attitude toward a supervisor, who took the class. This could be taken as an attitude the participant brought into the classroom or the effect of the workplace on their attitude. Likewise, a description of the change in attitude on the plant floor could have been understood as an effect of the class or how the workplace affected students' attitudes. As a result of these discussions, a new set of categories emerged that seemed to simplify and clarify the earlier problems. The new categories now included:

- Attitudes students brought with them into class (which would include the workplace context that affected students' attitudes regarding the class)
- Their reaction to the class activities and instructor
- The effect of having taken the class (which included new attitudes toward the workplace)
- Their attitude toward working with others in the class -collaboration

With the new categories, there was now 100% agreement with the categories.

As Bogdan (1992) and Glaser (1967) suggested, I then began to reread the collected items in each category to look for patterns and refine the existing categories. For each category, I began placing items in subsections that seem to fit. In the first category, for example, there were four sub-sections:

1. Attitudes students brought with them into class, as a result of:

- Workplace conditions that affected their attitudes toward the class
- Previous experiences in learning - childhood or training classes
- Personal frustrations
- Expectations of the class

2. Their reaction to the class activities and instructor

- Desirable instructor characteristics
- Instructor behaviors/activities appreciated
- Atmosphere that facilitated learning
- Methods/materials they liked
- Areas that could have been better

- Things they liked about the class experience

3 *The effect of having taken the class*

- What was helpful to them
- What they learned
- Benefit to company
- Interest in taking other classes

1. *Their attitude toward working in groups in the class-(benefits of collaboration)*

- Increased learning/achievement
- Positive attitude toward class
- Leadership skills
- Positive attitude/self perception
- Improved attitudes towards others
- Motivation (support by peers)
- Improved social skills

These categories provided a means for determining overall reactions of participants in all three classes in areas, such as attitudes toward working with others and importance of being listened to by others in the group or class, including the instructor.

For means of analyzing the impact of instruction, Figure 2 in Chapter 2 provided rough benchmarks that were used to determine the kinds of instruction/learning activity that took place in class. From the observations, the number of instructional/learning activities, the amount of class time spent on these activities, and student reactions were noted. The field notes for each class were examined and a code was written along the margin to indicate the type of instruction and the amount of time. Then the total number of

minutes for each type instruction or class activity was determined. The percentage of time for each type of instruction/activity for each class was derived by dividing the total time for each type of activity by the total number of class minutes observed. Originally the categories on the chart (Figure 2, Chapter 2) were used, but there were times in the classrooms when students worked independently, either on the computer or on a handout, although still teacher-directed, so this category was added to the list.

The final student interviews and class reaction surveys added to the data for determining learning activities and instructor behaviors that were most beneficial to students. Also these data were compared with instructors' surveys and interviews to determine the match between the expressed/indicated philosophy of instruction/learning with what actually transpired in class.

For analyzing student attitudes, Figure 1 in Chapter 2, provided a listing of benefits that have been shown to exist for students in other studies. This was used to help identify categories that have been beneficial in collaborative work. These provided a means of coding data, even though there were other areas that were added as the data were examined.

A t-test was used to compare gains made from the pre to post test, on the customized pre and post tests in math, communication, and quality control concepts. The results of these tests were studied to see if any relationship existed between the test scores and the style of instruction, the type of interactions, group work, or sense of community that existed in each class.

Validity and verification of data were determined primarily through two procedures, that of triangulation of data and second judgment audit (Lincoln and Guba

1985). There was cross examination of data from different sources, primarily observations, interviews and questionnaires/surveys and participation information forms. As data were examined from these different sources, areas of overlap were given special consideration. For example, teacher behaviors/attitudes were noted from observations in the classroom, some from student interviews, from instructor surveys, and also from the close-out instructor interviews. Validity and verification of coding categories were checked by having a second reader use the coding labels to determine categories/identifiers from the field notes or interviews. Where disagreements existed, the researcher and second party discussed and resolved any disputed categories.

Summary for Chapter 3

In this chapter, I have described the participants, the settings, classrooms and instructions, data collection and data analysis. I examined data to determine students' learning and their attitudes toward learning, relationship with factors, such as time spent in particular types of instruction, levels of student participation and influence of instructional approach and context. (See figure 5 for research questions, data collected, and method of analysis) This comparison, made of three workplace educational classrooms, helped determine benefits of using collaboration as an instructional approach for adults in workplace education.

Research Questions	Data Collected	Analysis of Data
Group situations impact on view of students' learning	Interviews Class reaction surveys	Coding Comparative method
Performance on pre-post tests	Pre-post test Customized tests	Paired t - test
Attitude and attendance differences	Participant's Enrollment Participant's Assessment Interviews Attendance sheets	Coding data Comparison/contrast Correlation of factors
Identification and influence of collaboration behaviors -Environmental context	Field notes Interviews Class reaction survey	Coding Constant comparative method
Effect of participation on plans to take other classes and self perceptions of abilities	Participant's Enrollment Participant's Assessment	Comparison
Relationship between participation and job related perceptions	Participant's Enrollment Participant's Assessment Interviews	Comparison

Figure 5. Research questions with type of data collected and analysis used

CHAPTER 4

DATA FINDINGS

Given the benefits of collaboration for participants in other learning situations, I wanted to find out if collaborative experiences would provide for the participants in workplace education the same benefits discussed in Chapter 2. In collecting data, I realized that there are factors that contribute to the effectiveness of learning, especially in a collaborative environment, over which I had little or no control, such as the way students were selected for classes. Observations of classroom activities were written down, data were collected from various forms/tests, and interviews of the participants and instructors were tape recorded and transcribed to determine the effectiveness of a collaborative approach in a workplace instructional setting. In this chapter, the findings from the data collected as they relate to the understanding of the research questions will be presented.

In the following discussions, the collaborative classrooms, Interpersonal Communication and Problem Solving (IPC) and Statistical Process Control (SPC) will be compared with the non-collaborative class Math for Machine Operators (MMO). In comparing the three classrooms to determine any differences that might be attributed to collaborative or less collaborative approaches, I will first present differences in instructor's beliefs/behavior from surveys, interviews, and observations of instructors as well as time spent in different types of instruction. Next, findings as they relate to the research questions will be provided. This includes achievement data from pre-post tests, students' surveys, and students' interviews. Also, attitudinal data as found in self-ratings in enrollment and assessment forms, student surveys and interviews will be presented. Lastly, results will be summarized.

Comparison of Approaches Used in Classrooms

To more effectively compare the three classrooms, it was necessary to examine factors that made the classrooms differ. The following discussion will present the beliefs about learning expressed by the two instructors who taught these classes. This information was provided by the instructor surveys and interviews. These beliefs will then be examined and compared with what actually happened in the classrooms, providing support for calling into question their beliefs.

Differences in Instructor Beliefs/Behaviors

Instructor Surveys and Interviews

Since the instructor is perhaps the most important factor in the learning experience, it was important to determine each instructor's beliefs and attitudes about students' learning to better understand what took place in each classroom. The survey, Instructor Behavioral Attitudes, (see Appendix C) was completed by each instructor at the beginning of the course. A closing interview (see instructor interview questions in Appendix D) with each instructor was recorded and transcribed. Summaries of the survey and the interviews for each instructor follow.

Instructor Behavior Attitudes Survey.

At the beginning of the courses, each instructor was given the following survey on which they indicated their ranking for each item. The results of this survey follow:

Table 4-1

Instructor Behavior Attitudes

As the instructor in charge, I would:

(range from 1 "to make an effort to do" to 5 "make an effort to avoid this")

	IPC Instructor	MMO/SPC Instructor
1. Closely supervise my students in order to get better work from them	3	3
2. Set the goals and objectives for my students and sell them on the merits of my plans	3	2
3. Set up controls to assure that my students are getting the job done	2	3
4. Encourage my students to set their own goals and objectives	5	2
5. Make sure that my students' work is planned out for them.	2	1
6. Check with my class often to see if they need any help.	3	2
7. Step in as soon as reports indicate that the assignments are slipping.	3	3
8. Push my class to meet schedules if necessary.	3	3
9. Check frequently to keep in touch with what is going on.	2	2
10. Allow students to make important decisions	5	2

Both instructors marked a 3 - middle ground -rankings for items 1, and 7, indicating that sometimes they would and sometimes they wouldn't closely supervise students or step in as soon as assignments were slipping. In other items, such as 2, 6, and 9, they also choose a somewhat middle ground . The significant differences were indicated in 4 and 10, regarding students being able to set their own goals or make important decisions.

For the most part, the female IPC instructor had the highest agreement with items which focused on control by the teacher. The items, such as setting up controls to assure students are getting the job done and never encouraging students to "set their own goals"

and never "allowing students to make important decisions," are related to a more teacher-directed attitude.

The male SPC/MMO instructor indicated that he would "set the goals and objectives for his students and then sell them on the merits of his plans." He also wanted to make sure that his students' work is planned out for them. On the other hand, he ranked a 2 in both items 2 and 10 indicating that he favored students setting their own goals and allowing them to make important decisions. The two last items were more evident in the SPC classroom than in the MMO classroom.

In summary, both instructors seemed in agreement with items that focused on setting goals and planning students' work ahead of time. Both indicated agreement with items favoring keeping in touch with students without stepping in when they saw students slipping. The IPC instructor seemed to have more teacher-directed attitudes, whereas the MMO/SPC instructor felt it was important to encourage students to set goals and make decisions, which was more clearly observed in the SPC classroom.

Instructor Interviews

The interview indicated that both instructors felt strongly that creating a comfortable environment was essential. They felt that students learn best if a rapport with students is established, if students are accepted as they are, and if they are treated as individuals. They felt it was important to treat these students as adults. Other responses for how they felt students learn best can be seen in Table 4-2.

Table 4-2

Instructors' Beliefs From Interviews

Area of Focus	MMO & SPC Instructor	IPC Instructor
Direction of power	<ul style="list-style-type: none"> -set goals and sell students on merits of plan -student work be planned out for them -students set own goals -allow students to make important decisions 	<ul style="list-style-type: none"> -didn't encourage students to set their own goals -never allow students to make important decisions
Class environment	<ul style="list-style-type: none"> -comfortable environment -supportive and open minded 	<ul style="list-style-type: none"> -comfortable environment
Teaching approaches	<ul style="list-style-type: none"> -organize curriculum in small steps -work in small groups -learn from each other 	<ul style="list-style-type: none"> -build on students' past experiences -pickup on non-verbal signals -one-to-one contact
Physical environment	<ul style="list-style-type: none"> -should not be too hot, crowded or noisy 	<ul style="list-style-type: none"> -comfortable for students
Class location	<ul style="list-style-type: none"> good to have at work site 	<ul style="list-style-type: none"> too many interruptions at work site
Use of group work	<ul style="list-style-type: none"> -students may be guarded about lack of skills -students learn from one another 	<ul style="list-style-type: none"> -students participate more in small groups
Assessment	<ul style="list-style-type: none"> -look at notes taken -test -how students explain things 	<ul style="list-style-type: none"> verbal responses
Use of questions	<ul style="list-style-type: none"> -find out what students already know about topic 	<ul style="list-style-type: none"> -open questions more beneficial-more informative -use questions to guide them in direction you want them to go -respect and acceptance students had for each other -dialogue
Liked best about class	<ul style="list-style-type: none"> -warm feeling -students feeling free to express themselves 	<ul style="list-style-type: none"> -respect and acceptance students had for each other -dialogue
Wished were different	<ul style="list-style-type: none"> -prevent supervisors from coming up to classroom for students -use more actual materials from the plant -CNC machines -more follow up with students 	<ul style="list-style-type: none"> -have a greater mix of hourly workers and supervisors -follow-up to be possible -less noise in classroom

Both felt that group work can be beneficial. They both indicated that students can learn from each other. The IPC instructor said that often students feel more comfortable and will participate and even take the lead in a small group, whereas in a large group, the same students wouldn't say anything. On the other hand, MMO/SPC instructor indicated that sometimes students are guarded about their lack of skills and may be uncomfortable

about letting others in the group know about their inadequacies. The MMO/SPC instructor indicated reservations about group work with some students, perhaps where discreet skills are more evident.

Regarding the question about assessing students, they both felt they would be able to tell from students' verbal responses whether the students understood course content. This helps support what was indicated in the Instructor Behavior Attitude survey with the item to check frequently to keep in touch with what is going on. The MMO/SPC instructor favored having students explain to the instructor how to do a certain procedure or teach the concept to someone else. He suggested having students do problems at the board. He also felt that he could tell from students' notes and from tests whether students understood. This last type of assessment was observed in the MMO classroom.

The instructors differed in the way they would use questions in helping students learn. The MMO/SPC instructor said it was useful to ask students what they already knew about a topic so he would know what needed to be covered. The IPC instructor felt that open-ended questions were more beneficial because students "expound more." She also said that the instructor could use questions to "get the students where you want them to be, that you can guide them in the direction you want them to go."

Regarding what they liked best about their class, both of them said they enjoyed the "warm feelings" with the students, the way the "students felt free to express themselves and learn from each other." The IPC instructor said she liked the way the students accepted and showed respect for each other. She also indicated that she liked all the dialogue that took place in the classroom.

For things they wished were different, they both mentioned site-type problems, such as lack of communication between management and workers, that sometimes it became a power issue, as it related to a supervisor's attitude toward a student in class. They also mentioned the noise level at the one site, since both used the same classroom at one site. Both said that they wished there could be more follow up after the class.

For changes they would make if they were to teach the class again, the MMO instructor said he wished he could relate the learning more to the actual situations that the students need to know. He would have included a hands - on demonstration of the machine they were learning about. The IPC instructor wished for a greater mix of hourly workers and management, less noise in the classroom, and follow up of the class.

The interviews supported some of the items in the Instructor Behavior Attitude survey. Both instructors indicated that a comfortable environment was important, supporting their attitude of not pushing the class to meet schedules or supervising too closely in order to get better work. Attitudes about students setting goals or making decisions were reflected in both the survey and interview.

Observations

Many of the things identified on the surveys and in the instructor interviews were supported by the observations. The instructor for the IPC class favored more teacher directed control in the survey, and this was evident in the IPC class. Although she was comfortable with students and attempted to make them comfortable in the room, she tended to keep a fairly tight grip on what transpired in the classroom. The IPC instructor clearly knew what her goals were and used outlines, lecture, charts, questions, teacher-led discussions, and teacher-led group work to achieve her goals for each session. At the

beginning of each session she handed out an outline with the objectives and activities for that session. After reading the outline with the students, she began the first activity, which was the ice breaker. Each session closely followed the outline.

From observing in the room, there were times that students sat with arms folded or heads in their hands or down on the table, when they were not actively involved, when she was lecturing or lecturing with questions. For example, in fieldnotes for 2-4-97,

Ms. E, the instructor, asked how perceptions affect communication. "Any thoughts?" (No response) She went on to explain that as in the exercise done earlier, we cannot always be sure others see exactly what we expect or what we have in mind for them to see. Some may have seen only a few details when you expected them to see the whole area or some may have seen the whole picture instead of focusing on a single item. She said communication is often like that. It can be confusing, because we are not always sure our message is being understood as we intended it to be. (She uses her hands to get across her point.)

Bert was sitting with legs crossed and arms folded. He handed me a stick of gum. Miles looked down at his paper. His jaw was resting on his elbow. Tim and Rob looked serious, sitting with hands to jaws. Ned was tapping his foot, his face in his hands.

She did include group work, which was appropriate for this class and fitted her belief that students participate more in small groups. She moved around between groups to listen to what participants were saying. She smiled often and made encouraging comments to students working together. In her interview she mentioned that students that wouldn't participate in the classroom will often participate and take the lead in a small group. She

encouraged individuals to share what they had discussed in the groups and always thanked them for sharing.

When students were actively involved in group work, students talked, laughed, and were alert as they worked to come to agreement. For example, on fieldnotes from 3-13-97:

She (Ms. E) said that today they would break up into smaller groups and decide which of the solutions were best, how you would plan to put them into effect, how you would evaluate to see if it worked, and to check to see if members had used active listening.

Larry led the discussion in his group. He read through the possible solutions and asked for their responses. He asked Ned what he thought. Ned says something but it is too noisy to hear what he said. Gene moved his chair over by Bert. Ned said he thought item 2 would help -set the clock earlier. Others talked about this idea, and Larry asked if they all agreed on that one. They did. Brian brought up the item that suggested that they stay overnight at a friend's house. He asked if it made a difference whether it was a friend of the same sex. Bert said, "Brian wants to forget that he is married." They laugh.

Bert asked Miles, sitting next to him, about what he did to get to work on time. Bert asked him slowly (Miles doesn't understand English well) "Miles, what do you do to get here on time?" He asked Miles if he goes to bed early. Miles nodded yes.]

Another observation, on 2-25-97, provides another example of the kind of participation observed as students interacted and actively worked together in small groups in the IPC classroom:

[She (Ms. E) introduced the ice breaker, "How good is your memory?" for which students had to be in three groups to collectively agree and draw the front and back of a penny from memory. This time, she had them divide up by last names, A-H, I-N, and M-Z.

[She (Ms. E) introduced the ice breaker, "How good is your memory?" for which students had to be in three groups to collectively agree and draw the front and back of a penny from memory. This time, she had them divide up by last names, A-H, I-N, and M-Z.

Those in the groups actively talked, laughed, pointed to the figure being drawn, argued about what should be where. After 10 minutes, Ms. E gave them a penny to compare to their drawing. No one had it exactly right.

Ms. E asked for their thoughts about the activity. Bert said he didn't know why they were doing this. Ms. E suggested that even though we are so familiar with ordinary things in our environment, we often are not aware of all the details, even as we are often not aware of the feelings, modes, and needs of others we are around day after day.

For the most part, the IPC instructor, who indicated that students participate more actively in small groups, did encourage small group participation and interaction on the part of students but was not always successful engaging students in participation. In this case the supervisor was in the class with the workers. There was also a small group of four students who seemed to have a negative attitude and indirectly sabotaged participation in the classroom. For example, Tim made negative comments to other students both during and outside of class. For instance, in the 3-5-97 fieldnotes:

Mrs. I commends him (Bert) for communicating to Miles. Bert said that people just have to talk slower to those that don't understand English so well

Bert said he would probably hear from Tim. He said after the last session, Tim mentioned that he was quite a chatterbox.

Also in his interview, Rod mentioned that Tim asked him if he had taken a Dale Carnegie course. Tim indicated in his interview that he just comes to work, "takes one day

at a time,” and doesn’t want to get involved any more than necessary. He was older, more solemn, and had been a supervisor in another plant. In the class he pretty much kept to himself. He indicated on his self perceptions that he was poor in basic skills. He hesitated doing activities that required reading and writing.

Another example of those with negative views and their impact on the lack of participation was seen in the 3-20-97 fieldnotes. *During a class discussion, Gene and Bert laugh to each other. Ned mutters something to them. A little later Bert makes a funny noise by forcing air through his lips. He and Gene laugh. Bert, Gene and Ned act silly and don't pay attention to the discussion.*

The other instructor, for MMO/SPC, was not always the best prepared, but was friendly, open and accepting of students, their opinions and goals. This behavior supports what he said about class environment in the interview. He tended to lecture or use lecture with questions in the MMO class, organizing curriculum in small steps, but did use questions for finding out what students understood about the topic, supporting what he said.

For example, from the 4-4-97 MMO fieldnotes:

About forty minutes before class was over, Mr. K, the instructor, began on fractions. He had written a lot of information about fractions on the large chart that was collapsed behind the cabinet. He got it out, stood it up and rather quickly went over fraction concepts. He did begin the discussion by asking them to tell what they knew about fractions. Charles said they were parts of numbers. Lynn said he had heard about proper and improper fractions. Herbert mentioned about ratios. Pam and Lois said nothing during the whole discussion on fractions. They appeared to be confused..

Mr. K covered the concepts of mixed, improper and proper fractions. He showed how to tell where the denominator was. It was "down" for denominator. He said that the fraction bar showed them to divide. He covered reducing to the lowest denominator. He showed a "tool" for determining the lowest common denominator. He said that when they take their test, they should take out their "tools." All through the discussion on fractions, the emphasis was on getting the right answer on the test. He said that if they didn't reduce to the lowest terms, the answer would be considered wrong. Likewise they had to turn the improper fraction to a mixed number for the answer to be right. He showed them how to add, subtract, multiply and divide fractions.

In the SPC class, on the other hand, it was evident that he welcomed the student-led interactions, supporting his view that students learn from each other, and became more of a facilitator in this class.

For example, on the 6-6-97 fieldnotes for SPC:

Mr. K asked them about quality control at the plant. This stimulated a lively discussion. Some felt that different inspectors use different ways to measure the same parts. One mentioned that he had two different inspectors and each came up with different ways of checking the same parts. Rich said that management tells his line to run the parts even if they are not "within specs." Evan said that when the auditors come in, they are told not to tell about problems with parts. Rich said that they shut down the South Line and pretended that there were operating problems so they wouldn't be inspected because that line runs "out of specs" so much. (Mr. K listened and asked questions that facilitated the discussion.)

From the comments in both the MMO and SPC classes, the students all mentioned that they liked his manner and interest in what they had to say. It was apparent that he related well to his students and they to him, which supports his belief that it is important to establish rapport with the students and make them feel comfortable.

From observations in his classrooms, he warmly greeted each student, made small talk with them before and after class, matching his views about being supportive, open minded and making students comfortable. Often during breaks, he visited with students about things that interested them-cars, sports, their children, their job, or tests they were going to be taking. He smiled often and commented or asked more about comments or questions students had. He stayed late after a SPC class to talk with Mike who had some concerns about the plant and the way things were being handled. Mr. K stayed and actively listened to Mike about 20 minutes without acting impatient.

In summary, both instructors felt it was important to establish rapport with their students. They both felt that a comfortable environment where students felt accepted and supported was necessary. This belief was supported in the observations of both their classrooms. They differed in learning approaches and assessment. The IPC instructor favored the use of group work and open-ended questions which encouraged more participation, sensing students' feelings through nonverbal signals and maintaining one to one contact with them. These views were supported in this classroom. The MMO/SPC instructor favored breaking instruction down into small steps and testing or checking students' notes to determine students' understanding in the classroom. This was observed in the MMO classroom. With the SPC class, the same instructor favored open-ended, small group work where students could learn from each other, whereas in the MMO class

he felt that students would be more guarded about lack of ability if small groups were used.

The more specific, math oriented content of the MMO class may have influenced his approach in this class, because in the fieldnotes he often referred to taking the test and how the specific "tools" he was teaching them would help them on their test. For the most part, the instructors' beliefs matched their behavior in the classroom.

Differences in Types of Instruction Observed

To see if the instructors used the learning approaches they favored in the surveys and interviews, the amount of time actually spent on different types of instruction was determined. The percentage of time for each type of instruction/activity for each class was derived by dividing the total time for each type of activity by the total number of class minutes observed.

Table 4-3

Minutes and Percent of Time Spent on Types of Instruction

Class	L	L/Q	TLD	TLSP	TLG	SLC	IND	Total
IPC	65 5%	85 7%	928 76%	102 8%	155 13%	20 2%	20 2%	1220
MMO	97 13%	145 19%	45 6%	0 0%	0 0%	95 13%	375 50%	757
SPC	45 10%	31/7% 7%	205 44%	0 0%	0 0%	165 36%	16 3%	462

Note. Type of instruction is indicated by the following:

- L = Lecture
- L/Q = Lecture with questions
- TLD = Teacher led discussion
- TLSP = Teacher led student pairing
- TLG = Teacher led group work
- SLC = Student led collaboration
- IND = Independent individual activity

From table 4-3, it is evident that the IPC class experienced a higher percentage of teacher-led discussion and teacher-led group work. The SPC class had the highest percentage of student-led collaboration with a high level of teacher-led discussion. Half of the time in the MMO classroom was spent in individual work on the computer. This work is similar to teacher directed lecture and questions. This class also had higher levels of “lecture” and “lecture with question” type approaches. If the individual work on computers were added to the lecture and lecture/question time, the MMO class spent 82% of its instructional time in teacher directed formats as compared to the collaborative classes. Since the multimedia program was pre-determined and allowed limited choice, such as which module to do or items to go back over, it could be considered teacher directed, since there were no open ended answers. In addition to the type of instruction in

the different classrooms, it is important to examine the differences in behaviors and speech of instructors and participants in the different classes.

Differences in Speech and Behavior in Collaborative Classroom

One of the research questions dealt with factors of collaboration instruction asking what behaviors and speech were observed in the collaborative classes as compared to non collaborative class. From the observation fieldnotes, the following were observed in the collaborative IPC and SPC classrooms and in the non collaborative MMO classroom. See Table 4-4.

There was more group and partner work in the IPC and SPC classes. Since the IPC class focused more on communication, it was more natural for this class to exhibit inclusive practices, such as encouraging others to share, etc. The SPC class dealt with quality concepts, but the content was conducive to interaction and discussion. In the MMO class, much of the work was done independently on the computer except when the instructor explained math concepts and showed how to do math problems.

Table 4-4
Instructors' Speech and Behaviors' Fit with Collaboration Model

Fit with Collaboration Model	IPC Instructor	SPC Instructor	MMO Instructor
Exploratory Talk	Asked follow-up questions to encourage dialogue	Asked questions to promote discussion	
-Participation	Encouraged students to participate	Encouraged participation	
	Asker' questions to encourage reluctant participants		
-Dialogue for discovery		Discussed authentic problems and sought possible solutions	
		Allowed students to discuss topics important to them	
Group Support	Encouraged group work for discussion	Provided opportunities for working together in groups or pairs	
	Paired off students for working together		
Role of Instructor	Made students comfortable by showing interest in their comments and questions	Made students comfortable and willing to take risks	
-Developed risk free environment	Included those who may be left out of discussion		
-Provided respect and support for participants	Thanked students for participating	Gave careful attention to students' comments and questions	
	Supported students when they made contributions or brought in items to share with group	Encouraged students to be open and speak freely	
-Facilitator	Provided warm welcomes	Provided warm welcomes	Joked with male students after class
	Set tone for the session by playing appropriate music on tape recorder	Made small talk about students' interests	
	Made small talk with students to get to know them better	Picked up on students' interest, such as items on a chart that would interest them	
	Got into discussions with students with relevant examples	Entered into discussion with personal examples where appropriate	

Speech and Behaviors that Were Helpful to Participants

Regarding behaviors and speech students said were helpful to them, students in all three classes emphasized the importance of being made to feel comfortable, accepted and treated like adults. The MMO class talked about such things as having things on the board and feeling relaxed in the class. The IPC class liked the friendly, comfortable atmosphere.

Different students mentioned that the instructor encouraged them to participate and then thanked them for participating. One said, "We weren't just being spoken to, we were asked to participate." Several mentioned that they felt appreciated by the instructor by the way she talked to them and took time to explain things. Another said he liked the fact that the instructor didn't single out anybody, she treated everybody the same. In the SPC class, students liked the instructor's open mindedness, interest in their comments and questions, and the fact that he didn't "ram a bunch of facts and figures down their throats." Different students mentioned that he made the class enjoyable by using real life situations.

It was evident in the MMO class that the more the students interacted with each other and with the instructor the more open and comfortable they became with one another. The more they communicated with each other, the more support they felt from their peers. The following fieldnotes indicate differences between example one and example two in students' comfort level from behaviors and speech of others in the class:

Example one, in an early fieldnote, 2-19-97:

Mr. K then told the students to open the computer program to the Introduction of Decimals. He checked to see that everyone was on the right place. He told them to read the information on each page and then click on the forward button at the bottom of the

screen to get the next screen. He told them to go ahead with this section, reading each page and doing the exercises at the end.

Most of the students did what he said. A few looked confused and raised their hands for help. Lois had difficulty with the first problem, which asked for the place value to be written out in words. Ross was concerned because he had written in the correct number but the computer response said it was wrong. Mr. K tried to help them understand that this was a pilot program and there may be some glitches in it yet. Charles, in the back row, said, "I don't like this program."

Example two, toward the end of the course, fieldnotes from 5-30-97 shows how students were interacting with each other. This behavior was spontaneous on the part of the participants, not directed or particularly encouraged by the instructor.

Charles tried to explain. Pat told Charles to be quiet and let her tell how she understood it. Lance said, "Slow down, Pat." Mr. K went through the problem again, trying to help her understand that when he put the decimal point, the numbers to the right of the decimal point had to have zeros if there wasn't a number to be divided into it.

Later they were asking questions, explaining concepts to each other, helping each other out with problems as compared to the frustration many of them experienced at the beginning of the class when they were working at the computers by themselves.

They progressed in their confidence from the early frustrations to the later spontaneous bantering and questioning of the instructor and each other. This type behavior was more evident toward the end of the class and continued with frequent occurrences until the class was over. In the interviews, they said that they liked to have their questions answered, to get help when needed, to feel support from peers, and to hear explanations

from peers. This was different from their early experience in the classroom, when they worked individually on the computer.

For further understanding of the differences exhibited in the collaborative classrooms an examination of the components of collaboration will be presented.

Fit with Collaboration Model

To determine the extent that the collaborative classes fit the model of collaboration discussed in Chapter 2, each component of the collaboration model will be presented and compared to what was observed in each classroom.

Exploratory Talk. By considering what others have to say, new ways of thinking are tried out which often results in clarifying existing understanding. Many IPC and SPC students commented in their interviews how much they were able to learn and better understand because of hearing different points of view on a given topic. They said they often heard something that they wouldn't have thought of by themselves. Exploratory talk was not present in the MMO class. See Table 4-4.

Group Support. The next element is group support, which is necessary for participants to feel comfortable to explore, reshape and incorporate diverse ideas. All the students in the SPC class and most of the students in the IPC class indicated that they felt supported in the classroom. In the IPC, all felt they were supported by the instructor and most felt that they were free to say what they wanted, that the rest of the class supported them. The only one who didn't feel supported was the supervisor. He was put in a difficult position, because he represented a different level of authority when they weren't in the classroom and he admitted he had been pretty rough on most of them, as a supervisor. This presented a difference regarding support level. As MMO students became more

comfortable with others in the class, they felt some support from others that helped them individually with math or computer problems.

Reflection. This component of collaboration encourages reasoning why things are done, enabling more ownership of the learning. This element could be observed in both the IPC and SPC classes to a certain degree. The instructors in both these classes, but especially in the IPC class, emphasized the reasoning and need for what they were learning. There wasn't time given for writing in journals, however, which is an effective way to reflect. Much of the reflection that did take place happened as students discussed what they were learning on the plant floor and in small groups that met together for lunch, breaks, etc. Little, if any, reflection was evident in the MMO class.

Extended Focus. This component of collaboration, suggesting the need to continue to explore over a long time, did not occur since none of the classes lasted more than ten weeks.

Role of Instructor. The collaborative role of an instructor is that of a facilitator and co-learner. In both of the collaborative classes, IPC and SPC, the instructors did work to facilitate the learning and entered into the discussions as appropriate. Especially in the SPC class, the instructor indicated that he learned as much as the students. In the IPC class, the instructor would go from group to group, asking questions to clarify or probe their thinking/reasoning. From what I observed, both instructors fit many of the characteristics described in the role of the collaborative teacher. See Table 4-4 The SPC instructor, especially, encouraged his students to explore and figure things out through collaboration. The IPC instructor encouraged many social skills of participants, because that was the nature of the class she was teaching. She, however, was reluctant to allow as

much student-led participation as she might have. The instructor of the MMO class was seen as a dispenser of information. He did not fit the role of a facilitator or co-learner in this class, as discussed in the teacher's role on page 42 in Chapter 2.

Role of the Participant. Some students in the IPC and SPC classes seem to take an active role in their own learning, more so in the SPC class. The students in this class seemed to be more focused on learning than the IPC class. It was also true that the SPC students took more active leads in discussing and trying to come up with solutions to problems. Students in the MMO class were more passive learners in the math content. They were more active in their learning when they could explore information in the Encarta encyclopedia computer program. For example they became more animated, were more alert. Smiled more, and they shared information they found.

Role of Group. The group as a public forum for ideas could more easily be seen in the SPC class. Although they were a small class that acted as a group, they did serve as a sounding board and reactor to ideas presented. Even though they often differed in views about quality or how parts should be checked, for instance, they respected each other's views and worked cooperatively to try to come up with ideas that would help their plant move forward in this area.

To a certain extent, students in the IPC class fulfilled the collaborative role of the group. When they were discussing the problem of getting to work on time or items they would select for survival, they listened to each other, discussed, argued, and then came to an agreement. There were always those few, however, that dampened the effectiveness of any group they happened to be in. Students in the MMO class did not fit with the

collaborative role of the group, but approximated some collaborative effort when they discussed or debated the best way to work a problem.

Although not totally a clear fit with the model of collaboration described in Chapter 2, there were some essential elements, such as exploratory talk and group support, present more so in the SPC class but also to a limited degree in the IPC class. The MMO class had little fit with the collaboration model.

Another indication of the fit with the collaboration model can be seen with the continuum from *lecture* type instruction (non-collaborative) to *student led* (collaborative) presented in Figure 2 in Chapter 2. Although none of the classrooms could be considered truly collaborative, the SPC class would place between *teacher led discussion* and *student-led collaboration*, because there was evidence of both. This class might be thought of as semi-collaborative with more evidence of collaboration than the others. The IPC class would place on this continuum between *teacher led discussion* and *teacher led group work*, because most of the interaction that took place in this class was teacher directed, making this less collaborative of the two semi collaborative classrooms. The MMO class would fit best with *lecture with questions*, because both in the instructor's approach and the work done on the computer program, this was the type of instruction given.

In summary regarding different instructional approaches and the time spent on each, it was evident that the class (SPC) having the highest collaborative involvement had the most active participation and involvement. The IPC class that would normally be considered the most collaborative in nature had some negative elements that hindered active participation on the part of some of the students. In the MMO class, which was not

really collaborative in nature, student attitudes toward the class and program improved as students became more comfortable and spontaneously interacted with each other.

Having looked at the instructor's approach in the classrooms, it is important to examine findings to determine what, if any, differences there were in the students' achievement and attitudes in these three different classes. In the rest of this chapter, findings from the data will be presented, as it relates to these factors. Lastly, a summary for chapter 4 will be provided.

Impact of Semi- Collaborative and Non Collaborative Classrooms

To determine the impact of collaboration as an approach in the workplace education, it is beneficial to look again at the research questions to see if the data collected provided the answers.

Differences in Participants' Learning

The **first research question** asked whether there are differences in the learning of students in these different classes. The first measure of students' learning is the results from customized tests given to participants at the beginning and ending of the course.

Formal Test Measurements

For each class customized pre and post tests were designed to reflect the content of the course presented in class. The same test was given at the beginning of the course and at the ending of the course to determine the learning of concepts presented. There were 30 items on the MMO test, 10 items on the SPC test and 10 items (with 3 points for each item) for the IPC test. Repeated measures paired sample T-tests were conducted for pre and post tests for each class.

Table 4-5

<u>T- Test of Customized Tests</u>				
Class	Mean	N	Std. Deviation	t
(Collaborative classes)				
IPC Pre-test	8.4167	12	7.4034	
IPC Post -test	15.0833	12	7.5973	3.523*
SPC Pre-test	3.3125	8	.9613	
SPC Post-test	5.5000	8	3.1623	2.364*
(Non Collaborative class)				
MMO Pre-test	18.8571	7	8.6685	
MMO Post-test	21.7143	7	4.2706	1.326

* .05

There were significant differences between the pre and post test means for both the IPC and SPC classes but not for the MMO class. These pre-post tests represented formal measures of student achievement. To consider additional measures of student learning from each class, data were examined which indicate what students themselves felt they learned from the classes. These data included Learner Expectation Summaries, Participant Surveys, and students' interviews.

Informal Measures of Learning

Tests can provide one measure of students' learning. Perhaps a better indication of what they learned can be seen in the things they said or wrote about what they learned or derived from the class.

Learner Expectation Summary. At the beginning of each course, students filled out the top half of the Learner Expectation Summary (see Appendix G) which indicated what they would like to learn or improve. At the closing of the course, the students filled out the bottom half of the same form on which they indicated if they learned what they wanted to learn, why not, and their interest in taking other classes. (Table 4-6)

Table 4-6
Learner Expectation Summary

(Completed at beginning of class)			
<i>Areas interested in learning</i>	IPC	MMO	SPC
Reading/writing	57%	45%	33%
Math	50%	78%	56%
Computers	50%	78%	83%
Communication skills	43%	67%	50%
Test taking	29%	45%	33%
(Completed at end of class)			
<i>Learned what they wanted</i>	65%	56%	66%
<i>Interested in other classes</i>	57%	89%	88%

The participants from MMO class had a closer fit with what they wanted to learn (math and computers) but had a lower percentage of having learned what they wanted. In contrast, even though the IPC students were required to take the class and didn't show a high interest in communication, a higher percentage of these students indicated they learned what they wanted. Also a high percentage of the SPC class said that they learned what they wanted, even though their highest area of interest was computers. The low level of interest in taking other classes for IPC students may be attributed to the relationship of low level basic skills and interest in taking more classes. Those in the IPC class that indicated lack of interest were those with poorer skills who were part of the negative peer group in that class.

Participant Surveys. At the close of each class, students filled out a survey form. This was composed of four open ended questions.(See Appendix H) Since the first question asked students what the course was mostly about, it is not discussed here. The second question in this survey addresses what students felt was the most important thing learned in the class.

IPC Class For the most important thing learned, five of the 14 students commented about knowing how to communicate better. Three students of the IPC class wrote that there are different ways to communicate and be understood. Two students of the IPC class wrote that it is important to listen and think about situations before answering questions. Another wrote "take a look at yourself and realize that you can't change others." Two of the IPC students wrote about active listening and different communication techniques.

MMO Class. For the most important thing learned, five out of the eight MMO students indicated the most important thing was learning math, which included number line, positive and negative numbers, ranges, averages, fractions, decimals, and order of operations. Three of the MMO students mentioned they had learned to operate the computer. One MMO student wrote that the most important thing is not being fearful to let others know about her lack of math skills.

SPC Class For the most important thing learned, 4 out of the 8 SPC students said the most important thing was understanding about SPC, how to collect data, what to do with it, and make decisions about quality. One SPC student wrote why quality was needed, and one wrote that everyone has a different opinion about what SPC and quality is.

Student Interviews. Student interviews also provided data about whether the students got what they wanted from the class. Questions (see appendix) were asked of each student during interviews at the end of the course. Two of these questions asked what had been learned in the class and how the class was beneficial to the student. The following information provides an indication of students' sense of personal achievement from each class.

IPC Class When asked about what they had learned, seven of 14 students said they had learned to communicate better with others. Five said they had learned to calm down and not get mad or to think first and then speak. Three indicated that they had learned why others act the way they do, increasing their understanding of others, that people "got to them" before taking the class.

For benefits that the class was to them, 5 indicated that they were able to use what they learned at home with spouse or children. Five also indicated that they were able to communicate better with fellow workers. Four indicated that they were able to understand why others act the way they do and this helped them to calm down and not get mad so easily.

MMO Class When asked about what they had learned, two out of eight MMO students indicated that it was a refresher of math. One indicated that he understood math better.

For benefits, two said that they were able to help their sons with their math. One indicated that using the computers helped him accept the new computerized machines coming into the plant.

SPC Class Five of the eight students said they learned what SPC involves and the need for quality. One said he learned the vocabulary used in SPC, about charts and SPC concepts. Another said he learned about budgeting. Another said he learned about the need for management and labor to work together for quality.

For benefits from the class, there were different comments. One said he benefited from understanding the terminology used on the floor. Another said he understood the

need for SPC in the plant. Another said they learned that everyone has a different opinion about SPC and the need for everyone to work together for quality control.

From the comments about what was learned or beneficial to them from the class, it would appear that there were more positive links to the content objectives of the courses in the IPC and SPC classes. This may be a result of closer links with personal benefits as well as the instructional approach used in these classes. Students in the IPC class could see immediate benefits in using the concepts and techniques in communicating with others whether at work or home. The students in the SPC class, because they were team leaders, may have been able to see more direct connections to their function as team leader in achieving quality on their lines. Some in the MMO class didn't work on a CNC machine for which the program was developed, so these may have affected their responses.

As far as expectations being met - getting what they wanted from the classes- the collaborative classes had more positive comments in the interviews. In the IPC class, 71% said they derived what they wanted from the class. In the SPC class, 38% said they learned what they wanted. Their goals were achieved. In the MMO class, only one said he/she learned what was wanted. This was also supported in the Learner Expectation Summaries.

(Table 4-6)

Differences in Attitudes of Participants

The **second research question** asked whether there are differences in self perceptions of learning for the students in these three classes.

Self Perceptions of Participants

An important part of students' self perceptions are their perceptions of themselves as learners. This issue is addressed in the Participant Enrollment and Assessment forms.

Participant Enrollment and Assessment Forms. At the beginning of the course, each participant was required to fill out an Enrollment form (see Appendix F) which provided information about the student, his age, race, job description/position, training taken. The students ranked self-perceptions of their ability in English, basic skills, ease in learning new things, test taking abilities, and attitudes toward workplace conditions. At the end of the course, students filled in a similar form, called a Participant Assessment Form (see Appendix F), in which the students indicated if they had learned what wanted, their interest in taking other classes, and their self-perception rankings similar to those in the Enrollment Form. Table 4-7 indicates the number of students in each class that increased or decreased in their rankings in a given area from the beginning of the course to the end of the course

Table 4-7

Percentages of Changes in Self Perceptions on Participant Forms

<i>Items taken from the forms:</i>	<i>IPC</i>		<i>MMO</i>		<i>SPC</i>	
	+pos	-neg	+pos	-neg	+pos	-neg
<u>Perceptions of Competency in English</u>						
Reading in English	7	0	0	11	25	0
Understanding English	14	0	0	11	12	0
Speaking in English	0	36	22	0	same	
Writing in English	7	0	0	11	38	0
<u>Perceptions of Skills uses on the Job</u>						
Working as a team	35	14	0	11	38	0
Math	14	29	33	11	38	0
Problem solving	14	29	0	22	38	0
<u>Perceptions of Conditions at Work</u>						
Satisfied with job	14	29	33	11	25	0
Job performance	14	14	11	11	same	
Cared for by upper management	21	14	22	0	0	13
Supervisor understands	14	14	22	11	same	
Culture appreciated	14	21	33	11	same	
Technology changing my job	29	29	22	0	13	0
<u>Perceptions of Abilities</u>						
Like to learn new things	43	0	11	11	same	
Good test taker	7	43	33	0	same	
Learn new things easily	36	7	44	11	38	0
Good at reading	14	29	33	11	25	0
Good at writing	14	14	22	0	same	
Good at math	7	7	33	11	38	0
<u>Computer Interest and Competence</u>						
Computer literate	7	7	22	0	38	0
Like computers	14	7	22	11	13	0
Use computer at home	7	7	11	0	13	0

The class that had the most collaborative type learning (SPC) had the lowest percentage of negative change, regardless of the nature of items. The SPC class had the highest percentages of positive changes in proficiency in English and skills used on the job. The only negative shown by SPC was "cared for by upper management". This may be a result of discussions that took place in class focusing on the lack of communication that exists between labor and management. Negative change for the IPC class may be related

to the small group of students with negative attitudes in this class. On the other hand, it may also have to do with increasing awareness of their competencies, or lack thereof, as well as feeling more free to speak out about conditions in the plant.

Self-perceptions about students' abilities in reading, writing and math presented some surprises. The MMO class had the highest number of those who made positive changes in self perceptions of reading, learning new things and test taking. It is understandable that the test taking percentage of change was highest for the MMO class, since there were many opportunities to take tests given during the course. Also, the focus of the class seemed to be the test given at the end of the class. Test taking ability and confidence were developed in the MMO class with frequent tests provided both in the classroom and on the computer program. SPC had the highest percentage of change in competency in reading and self perception of ability in math. Regarding understanding and speaking English, IPC had the highest percentage of increases in understanding and speaking English. Regarding working as part of a team and problem solving, the two collaborative classes far exceeded the MMO class.

There doesn't seem to be a high relationship between the increases in positive indicators in the learning areas with class content in the MMO class. Given that the MMO Class focused on learning math, that class would be expected to show the highest percentage of change in learning math. That expectation did not occur. Instead MMO showed the highest percentage of change in reading and SPC showed the highest percentage in math, which wasn't a focus of the class. More significant would be the team aptitude which showed highest in the collaborative classes, which would seem to indicate

that actually working together in collaborative activities promotes team work and problem solving, which companies say they want in workers.

Differences in Participants' Attitude Towards Classes

The **third question** asked if students in collaborative settings have different attitudes toward the class. Data addressing this issue are presented from the Participant surveys and student interviews.

Participant Surveys. From the Participant surveys and student interviews, there is support for collaboration as an effective way to learn. The Participation Surveys (see appendix) were completed at the end of the course. Students responded to open-ended questions, in this case a question about what they liked most about the class.

IPC class. For the question regarding what they liked most, three students in the IPC class indicated that they liked what they had learned about communication - that people hear and decode messages differently. Three students in the IPC class indicated that the class helped them open up, that they were able to talk more openly to others, and felt free to express their opinions. One student in the IPC class said "thinking and listening." Another said the group discussion. Two students in the IPC class indicated that they liked the way the class was taught and that the instructor was "good about making sure you understood." Another in the IPC class wrote that he liked the positive attitude.

MMO Class. For the question regarding what they liked most about the class, three out of eight of the MMO students said learning about and "using computers." Three of the MMO students wrote that they liked the instructor, who was very patient. Two students in the MMO class wrote they liked learning math. Other comments included:

- Meeting new friends

- Communicating with others
- "Being able to participate in the learning process right here in the plant"
- Receiving a thorough explanation of topics; step by step instruction
- "No pressure - friendly environment"

SPC Class. For the question regarding what they liked the most about the class, SPC students indicated that they liked "discussion," "expressing ideas," "active communication," "communicating with others," "the relaxed atmosphere," and the "easy going teacher."

The IPC class indicated more links to the content of the class. In all three classes, the things they seemed to like best were interactions with others, comfortable atmosphere, positive attitudes, and caring instructors. The positive attitude toward learning with and from others is supported in the students' interviews.

Student Interviews. Students from all three classes indicated in the interviews, that learning from others was beneficial. Students in the IPC and SPC classes indicated that it helped to have a variety of perspectives as they worked in small groups and that some who wouldn't participate before opened up in the small group setting. Students in the MMO class said that being with others in the class was enjoyable and interesting and that hearing others in the class explain concepts helped them better understand.

In the part of the interview concerning what helped them to learn, 63% of the MMO class indicated that it was helpful to hear others work out problems, work with a partner or have interaction with others. Even though they had few opportunities to work as a group, there were 11 comments from their interviews that related to the benefits of working

together, whether with a partner, getting information from others, helping each other, discussing problems as a group.

In the IPC class, 64% indicated that they learned by talking things over with others, seeing others views. In other parts of the interview, seven of 14 said they enjoyed working in groups, four said they learned from what others said, six said they understood others in the class better than before, four said it was helpful to talk things over before making decisions.

In the SPC class 15 comments referred to the benefits of working together in groups, such as a good way to learn, get a variety of ideas, learn from others, get better results, people listened to each other, made solving problems easier.

Many of the comments on the Participant Surveys and from the interviews indicated that what students liked best about the classes was the interaction and learning together. Students also felt that working together in a group or with a partner was beneficial to their learning.

Differences in Attendance Patterns

Question four asked if there were different attendance patterns in the different classes. Attrition can often be an indicator of interest/attitude by participants. In these three classes, release time was provided, and comparisons were difficult to make. One factor was the time of the class in regards to their shift. The SPC class was held at the end of the shift, so on warm and inviting Fridays, there would often be poorer attendance. Another factor was the strike at the plant in which the MMO class was held. Skill ability of participants may have been a factor as well. The one participant in this class (MMO) with the poorest attendance record was the one with the lowest math skills and a negative

attitude towards schooling. Overall, it was difficult to see significant differences in attendance among the three classes.

Differences in Participants' Plans to Take Additional Classes

Question five dealt with plans to take other classes. Plans to take additional classes can indicate students' interest in learning and may reflect on the experience they had in the present class. From the Learner Expectation Summary, 57% of the IPC students indicated an interest in other classes; 89% of the MMO and 88% of the SPC students also indicated a similar interest. The results from the Participant Assessment forms showed similar indications with 57% of the IPC students, 89% of the MMO class and 80% of the SPC class interested in taking other classes. The MMO and SPC classes had the highest percentages of students who wished to take additional classes. IPC had a lower percentage possibly because they had no choice about taking this class and also there was a group of discontents in the class.

Differences of Environmental Context in these Classes

For **question six** regarding the affect of the environmental context on their learning, it was difficult to see much difference since the same teacher taught both the MMO and SPC class. He was a very patient, friendly, open minded, encouraging instructor with both classes. The IPC instructor, also, was a very friendly, accepting, encouraging teacher who made students feel comfortable. Students in all three classes did say that being made comfortable and relaxed in the class helped them learn.

There were some comments as to the conditions in the classrooms. Those in the IPC and SPC, who met in the classroom over the press machines, mentioned that the noise resulting from the operation from the presses was distracting. One in the MMO mentioned

that the room was crowded and that the equipment wasn't always working properly. Since these students spent much of their time on computers, there were times when the printers weren't working or items in the multimedia program didn't work as expected, such as indicating a wrong answer when it was right. For example, in the 2-19-97 field notes,

Ross was concerned because he had written in the correct number but the response said it was wrong. I checked it out and, sure enough, the program was in error. As other students tried this problem, which was the writing in of hundredths to indicate the value of the digit two places to the right of the decimal point, they became frustrated with the wrong response. Mr. K tried to help them understand that this is a pilot program and there may be some glitches in it yet.

Most liked having the convenience of having the class on site.

Differences in Attitude Towards the Workplace

Question seven asked if there was a relationship between participation in the particular class and satisfaction with job and job performance and feeling of being appreciated by upper management. From the Enrollment and Assessment forms on which these items were included (Table 4-7), it would appear that the MMO had a higher percentage of those satisfied with their job, but IPC had a higher percentage of increase in positive points for job performance. As far as being cared for by upper management, there was a higher percentage of increase in positive changes for the IPC class.

From the interview comments, students from the MMO class said very little about their workplace, except that they sometimes couldn't get off work to come to class. Students from the IPC and SPC classes were much more vocal about conditions at the workplace. Even though they complained a lot about conditions at their plant, they also

had the most positive comments about wanting things to work out at their plant and if they all work together, they felt they could make it happen. Different students, especially in the IPC class indicated improvements in communications on the plant floor because of the class. Also because their supervisor was in the class with them, some said that they saw a change in him in the way he communicated with and understood them.

The more collaborative classes provided more opportunities for discussing conditions at the plant. Participants were more vocal in expressing their views, which were often negative, but they also sought ways to bring about improvements.

Summary for Chapter 4

Many forms of data were collected and examined to determine possible benefits of collaboration in workplace education classrooms. From the repeated measure t-test of the pre to post tests, the classes with more collaborative approaches scored better. From the interviews and surveys, a higher percentage of students from the semi-collaborative classes indicated they had learned what they wanted. They felt that the content of the class was beneficial to them. In all three classes, the things students seemed to like best were interactions with others, comfortable atmosphere, positive attitudes, and caring instructors. From the instructor surveys and interviews, students' interviews, fieldnotes-which indicated the types of instruction/activities that took place, participant surveys, learner expectation summaries, attendance forms, pre-post tests and attitude rankings, there is support for collaboration as an effective instructional approach in the workplace education classroom.

To determine the significance, if any, from this study, it is necessary to examine the different type of approaches used in these classes and their results. If achievement is the

goal, the more collaborative approach showed the strongest results both from the tests and from indications of what was learned. For positive attitudes regarding their own learning, there is evidence to suggest that students in all three classes preferred to learn in interactive ways, to learn with and from others. Learning in a more collaborative setting was more effective for achieving positive results in problem solving and teamwork. Collaboration showed higher gains in the areas of self worth and self perceptions, important areas for all students. It would appear that collaboration is an effective approach for learning, especially in workplace education. Employers want workers who can work together in self directed teams of diverse members who can spot and solve problems, make decisions and take responsibility for these decisions. Collaborative approaches to workplace education seem to be a good fit with both educational goals as well as workplace goals.

In the next chapter, I will discuss the significance of the data with possible explanations, limitations, and implications for application.

CHAPTER 5

DISCUSSION OF DATA RESULTS

This study compared three workplace education classrooms, two with a more collaborative approach and one with a non-collaborative approach, to determine possible differences in achievement and attitudes resulting from these approaches. Formal measures of achievement consisted of customized pre and post tests. Informal measures consisted of surveys, interviews, and participant summaries. First I will present my expectations of the data which I anticipated from reading previous collaborative research, briefly discuss the results of the study, and then provide possible explanations for the data results. Limitations of the study and implications for further research will then be presented. Finally, implications for instruction, especially for workplace and adult settings, will be provided followed by a summary.

More Learning and Satisfaction in Collaborative Classes

From previous research on the effect of collaboration on achievement, I expected higher levels of learning in the collaborative classrooms and that is what I found. Formal measures of achievement taken from the pre-post customized tests indicated that students learned more in the collaborative classes. Informal measures from these collaborative classes also indicated more satisfaction from taking the classes and achievement of student goals for taking the classes. These findings were indicated in class surveys, summaries, interviews and observations. This fits with research conducted by David and Roger Johnson (1989), Slavin (1983), Argyle (1976) and Barnes and Todd (1995) that showed higher achievement from collaborative as compared to less collaborative approaches.

In these studies students shared work, discussed materials, explained concepts to each other, and felt responsible for peers' learning. In the collaborative classrooms studied, I also observed students sharing work while working in groups, interactive discussions, and students explaining concepts to each other. There was no evidence of students taking responsibility for peers' learning or, in the case of Slavin's research, rewards for group work. There was, however, evidence of peers learning from peers, supporting Argyle's findings that showed that sharing similar cognitive constructs makes learning easier.

The expectation for more learning from collaborative classes was supported in this study. Previous research on collaboration that resulted in higher achievement, cited earlier, was conducted primarily with elementary and secondary students. Success in achievement was also evident with these adult learners in collaborative classrooms.

Interaction as a Possible Factor for More Learning. One possible reason for more learning in a collaborative classroom is the opportunity to construct knowledge together. In the SPC and IPC classrooms, there were opportunities for interaction. In this study, students indicated in their interviews that they learned more by hearing others explain ideas as well as asking questions and entering into the discussion. Enhancement of understanding through talking fits with the research conducted by Johnson and Johnson and Holubec (1990) and Barnes and Todd (1995) who also found talk to be an important part of higher levels of critical and creative thinking processes. A common thread that ran through all three classes was the matter of being heard. Comments from interviews indicated that students felt it was important to have their contribution, whether comments or questions, taken seriously and listened to. Students felt it important to have a chance to

express their ideas and clarify their misconceptions. This fits with the research conducted by Barnes and Wells, in which participants were able to bring their thoughts out into the “public arena” to question, adjust, and reconsider their positions.

For example, the SPC students were successful in changing misconceptions through dialogue. One SPC student commented that each participant had a different concept of quality, but as they talked together, they arrived at closer agreement. Also students in both the IPC and SPC classes indicated, from their interviews, that they learned more from others who “talked the same language.” This learning fits with Argyle’s research (1976) which suggests that peers who share similar cognitive constructs communicate more easily with each other than with the instructor.

These interactions are so important that in the MMO, which was not a collaborative class, students devised ways of interacting with each other, as the class progressed. They helped each other by explaining math problems or helping with computer problems. MMO students reported how beneficial it was to have a fellow student explain things. Formulating ideas and talking through concepts with others was found to be an effective way to learn. In addition to interaction, authentic or relevant topics may have contributed to more learning.

Relevance of Material May Have Impacted Learning. In addition to collaborative interactions, relevancy of the content may have been a factor contributing to the higher achievement levels attained in the IPC and SPC classes. The content of the collaborative classes was possibly more relevant to the participants. Participants indicated in their surveys and interviews that they could see direct benefits of course work for their lives, both at work and at home. The IPC class focused on interpersonal communication

problems and corrective strategies. Participants could easily relate to these problems and put the solutions to use immediately. While not something of personal use, the SPC class dealt with quality issues that were important to these participants. The students in that class were the team leaders and were involved with these quality issues in the plant on a daily basis

The MMO class, on the other hand, focused on math and foundational concepts designed for CNC operators. Half of the students, who freely volunteered for this class, were not working on CNC machines. The content of this class may not have been as relevant to them. Students may not have known what the content of the class would be when they signed up. Because it was in the computer lab, they may have thought it was a computer class. Some in the class indicated that they just take classes to learn new things. Since they were given release time for classes, students sometimes sign up just to get away from work.

Interactions of participants and relevancy of material may have contributed to the achievement results of this study. In the following discussion, factors that may have contributed to attitude changes will be presented.

Positive Changes in Attitude Are Dependent on Many Factors

I expected that students in the collaborative classrooms would show evidence of improved attitudes towards others in the groups, self-perceptions of their own abilities and attitudes towards "school." I expected that students in the collaborative classes would show higher indications of wanting to take more classes. Studies by Johnson and Johnson (1981,1984, 1989), Tinzmann (1990), and Slavin (1983) indicated that students of diverse abilities and background, who worked together in small groups, had more positive attitudes

towards school and towards others in the group. The students in the above studies felt liked and supported by peers as well as improving their own self-perceptions.

Students in the collaborative classes showed more positive attitudes toward their classes. They also had more positive self-perceptions of their competencies in English, learning new things, working as a team, and problem solving. Regarding plans to take other classes, the IPC class had the lowest indications of interest. I expected the IPC class to have the most improved attitudes because it was the most collaborative and could possibly have the most improved attitudes towards “school” indicated by interest in taking other classes. This, however, was not the case. Both the SPC class and MMO class had higher percentages of those interested in taking other classes.

The IPC class might have had higher interest in taking other classes if it weren't for a small group of negative students, which will be discussed next. Even with the negative group in the IPC class, there were high percentages of positive changes in self-perceptions in the IPC class, especially in *working as a team*, *liking to learn new things*, and *learning new things easily*. Attitudes, such as self-perceptions of one's learning and attitudes towards taking other classes may have been dependent on factors other than a collaborative approach in the classroom.

Class Selection and Composition May Affect Attitudes. The composition of the IPC class and the circumstances under which the students attended presented definite disadvantages. Participants for the IPC class had no choice about attending this class. The plant management mandated them to attend. Apparently workers of this particular line were the “problem kids” of the plant who refused to go along with efforts to establish teams for the Continuous Improvement emphasis in the plant. Also they did not get along

well with their supervisor, who was also instructed to take this same class. It was hoped that this class would be effective in helping resolve some of these problems. Because some of the IPC students didn't wish to be in the class, in the first place, they exhibited a negative attitude throughout the class.

Class selection and composition may have contributed to students' attitude towards the class and plans to take other classes. The make up of the three classes was quite different. In the IPC class, there were two representatives from management with hourly workers. This included one supervisor and one female from Human Resources. The SPC class had all males who were team leaders. The MMO class had all hourly workers, mostly males from the same shift.

The SPC students, however, were also mandated by management, but the participants seemed to enjoy the class and didn't mind attending. The MMO students volunteered to attend and seemed interested in taking classes, if for no other reason than just to get off the line. Both the SPC and MMO students showed high interest in taking other classes. There are also additional factors that need to be taking into consideration.

Instructor and Supportive Environment Important to Participants' Attitudes An important factor that may have influenced the attitude of some of the participants in the classes was their rapport with the instructor and the supportive environment in the class. One of the reasons for positive attitudes toward the SPC class and high interest in taking other classes may have been the male instructor. Although this instructor was not always well prepared for class sessions, he was very friendly and relaxed and did make students feel comfortable in the class. He talked informally with them and provided activities that the students, as adult men, would enjoy. For example, they developed a chart together

showing their choices for various items- such as make of car, sport enjoyed, companion preferred, choice of beer, etc.

Several students in the MMO class indicated how much they also liked this instructor, who was also the SPC instructor. They mentioned how comfortable he made them feel in the class. One participant said that he felt comfortable enough to admit his limitations in math.

Although several IPC students indicated in interviews and surveys that they appreciated the positive attitudes of the female IPC instructor and her supportive manner, the fact that she was a female may have contributed to a less positive attitude toward the IPC class. Students in this class commented that she always encouraged them to participate and thanked them when they did. They also mentioned that she showed interest in them as individuals and would speak to them when they came into the classroom or talked to them during the break. On the other hand there were some students in this class who may have felt uncomfortable with a female instructor. In his interview after the IPC class, Gene said he couldn't communicate with Mrs. I, who helped facilitate in the IPC class, that she reminded him too much of his older sister. He, and possibly others as well, felt more comfortable and used to working with "guys." The fact the IPC instructor and helper were females and there were other females in the class, one of which was from Human Resources, may have contributed to Gene's and possibly others' negative attitude in this class. Because Gene felt so comfortable in the all male SPC class, it is possible others in the IPC class would also have had similar feelings.

The fact that there were only males in the SPC class may have contributed to a closer bond and more positive feelings towards this class. One of the students from the

IPC class, who had been reluctant to participate, was one of the main contributors in the SPC class. He mentioned often how much he liked the SPC class as compared to the IPC class. He felt there was a special feeling among these SPC students, perhaps because of their commonalities, the manner of the instructor, and the informal instructional approach of the class. The fact that they were all males no doubt influenced his feeling. These participants not only discussed relevant material but felt comfortable with others of like mind and similar position in the plant. Another important factor that may have contributed toward the tight relationship in this class was the fact that there were no women in this class. Male interests were used as examples throughout the course that wouldn't have been appropriate with female participants. They could speak freely because there were no representatives from management, there was no one lower than their position, and they had the support of other male peers. There was perhaps a greater sense of personal satisfaction with the content, instructor, and informal, male-friendly, supportive environment of this class. There may have been other factors present that affected participants' attitudes, one of which was low basic skills.

Low Literacy Skills May Affect Attitudes of Some Participants. Another factor that may have affected attitudes toward learning in general was poor basic skills of some participants. In the IPC class, there were four or five workers with low basic skills. When handouts were to be read, or something was to be written, this group of students balked and either slowly processed the assignment or just sat and did nothing. One student, Gene, just sat there, looked around or made airplanes out of his papers rather than admitting that he couldn't read or write well. This may have been because he was the line leader, who admitted on his enrollment form that he didn't perceive himself as good in team skills and

also indicated his poor basic skills. In their interviews, surveys, summaries and participant assessment forms, most of these negative students' comments about the class were negative. They also indicated that they were not interested in taking other classes. They made it clear they had not been interested in taking this class or anything to do with it. In interviews with other students that knew these workers and worked with them, it was clear that this small group had been a negative influence not only in the class but also in the plant. This may help explain negative rankings on the self-perceptions or other attitudinal indications for the IPC class.

In the MMO class one student with low level basic skills also had negative attitudes toward the class and indicated no interest in taking other classes. Since he was the only one and had irregular attendance, he did not impact the class like the negative group in the IPC class, where the team leader was one of the negative four.

Many factors may have contributed to attitudes of participants. Besides the instructional approach and environment established in the classroom, there were other possible contributing factors, such as class selection and composition, perception of skills, and instructor gender. Although there were many negative attitudes exhibited in the IPC class, that was expected to show the most benefits from collaboration, there were indications of improved attitudes towards working in teams and problem solving.

Improved Team Working and Problem Solving in Collaborative Classes

It was expected that the collaborative classes would score higher in team working and problem solving and this was what happened. Not only does collaborative research support improved intergroup relations and working together to solve problems, but the collaborative classes had opportunities to actually work in groups to work through

problems. There were higher indications of positive changes in team effort and problem solving in the IPC and SPC classes, as indicated on participant assessment forms.

This fits with research by Johnson, Johnson (1983), and Cooper and Mueck(1992) and Tinzmann(1990) that indicated increased methods for figuring out new ways of dealing with issues as students worked together. Another factor important to team work and working well together is acceptance and respect of others. One of benefits of collaboration, as indicated in research conducted by Slavin (1983) and Johnson, Johnson, Pierson, and Lyons (1985) involves acceptance of people from diverse backgrounds, race, and culture, as well as improved relationships between students and other students in class. It also includes liking and caring for those worked with as they were able to get to know each other as they worked together. Acceptance of others could be seen in all of the classes as participants got to know each other better and interacted with each other.

Although all the participants in the IPC class, except the young woman from Human Resources, worked together on the line and knew each other, there were age, racial and gender differences in this class. Of the fourteen participants, most were between 20-40 with four over 40. Three were females, three were African-American, two were Slavic, and the rest Caucasian. Abilities ranged from four with low basic skills to one with a college degree. Seniority ranged from less than a year to one with 40 years in employment. As the class progressed, most students had positive feelings toward the others in their small group or in the class. Several students mentioned in their interviews that they felt supported and appreciated by the others, both instructor and students, in the class.

The SPC was the most homogeneous, with all males between 30-40 with the same positions in the plant and similar years of seniority. There were some racial differences

with two African-American, 1 Middle Easterner, and the rest Caucasian. Two in this class had low basic skills, one had attended college, and the rest had high school diplomas or GEDs. Even though there was some diversity in the participants, there was cohesiveness between the participants, openness of ideas, lots of sharing and taking risks.

The MMO class was the most diverse with workers from different departments, range in skills, difference in gender, age, race, and seniority. Of the nine participants in the MMO class, two were much older, had more seniority and held union steward positions. The others ranged from mid 20–40 in age. Three were females, six African-American, one Armenian, and one Caucasian. Abilities ranged from two with low basic skills to two who had attended college. As these MMO students got to know each other and devised ways to interact with each other, such as helping one another with computer program problems, they felt accepted and supported from the others in the class.

As far as getting along with people from diverse backgrounds, this was evident in all of the classes because they all felt comfortable, relaxed and accepted by their instructors and got along well together. There were a few, like Jeff in IPC, who said he didn't like the ones he worked with on the line, who were also students in the class. In his case, he expressed discontent with most everything having to do with the plant and his present stage of life. This was an attitude he brought with him into class from the beginning. For the most part, students indicated they enjoyed the other students and activities that allowed interaction with others.

In summary, the results of this study suggest that collaboration is effective in increasing learning and improving team effort with problem solving. Achievement and attitude changes may have been impacted by collaborative interaction, relevance of the

course, and supportive environment. Possible factors affecting team-work include acceptance of others as well as opportunities to work in groups to solve problems. Factors, such as instructor gender, selection and composition of the class, and limited skills may also have negatively skewed the results from all classes in a negative manner.

Limitations of the Study and Considerations for Further Study

There were several limitations with this study, over which I had no control, because of the settings, composition of classes, conditions under which the classes were held:

1. The content of the classes.

The IPC and SPC class content dealt with abstract concepts which had immediate application, whereas the MMO class dealt with specific, discrete facts, that were not as closely applicable to their lives

In future research it would be helpful to use different instructional approaches, collaborative and non-collaborative, with two classes with identical course content. Both the IPC and SPC classes dealt with concepts that were more conducive to group work and discussion. It would be useful to make comparisons in classes with the same content.

2. The method of selection of students for the classes

Students for the IPC and SPC were mandated to take these classes by plant management. Students for the MMO class freely volunteered for this class. In future research, control classes with students who came of their own free choice should be compared with classes where no choice is given.

3. Size of the classes

The classes studied were relatively small. It would be beneficial to replicate this study with larger groups to determine possible effects of larger groups with the results.

4. Difference in composition of the classes.

In the IPC class, the supervisor, whom several of the workers disliked, was present in the class. This factor had a chilling effect on some of the students. Since those in the IPC class had no choice in taking the class and had their supervisor with them, this presented some problems that weren't true of the other classes. Future research should consider classes with a mix of management and hourly workers to be compared with classes of only hourly workers or only supervisors to determine any differences in participation. Classes that contained female participants should be compared to classes with no females to determine possible effect of male attitudes.

5. The approaches of instructors.

The instructor of the IPC class, who was expected to be the most collaborative, was more teacher-directed in her approach. To obtain a clearer distinction between collaborative and non-collaborative approaches, it would have been desirable to use instructors with beliefs and behaviors more closely matching the approaches compared.

6. The same instructor taught two classes.

One instructor taught two of the classes, one collaborative and one non-collaborative. A suggestion for research would be conducting three or more classes in different subjects each with a different teacher. It was difficult to determine whether some factors in the SPC and MMO classes were due to different approaches or because both had the same teacher with a personality that fit more closely to the collaborative model.

7. Gender of instructor

One instructor was a female and the other instructor was a male. It would be helpful to have instructors of the same sex for each of the classes. This would provide more effective comparison for attitudes of males in the class.

8. Only two plants in one city were studied

This study was limited to only two manufacturing plants in one large, mid western, metropolitan area. It would be beneficial for others studies to be conducted with more and varied plants involved. The sites used were manufacturing sites. Other workplaces and businesses, both urban and rural in other parts of the country, should be considered in replicating this study.

Other Considerations for Research.

Much instruction in workplaces is conducted by outside "experts" hired to train workers. It might be worthwhile for collaborative and non-collaborative approaches used with this type of class to determine effectiveness of training and other related benefits, such as problem solving and team behaviors.

Another consideration for research is to compare classes of students with poor basic skills with students who feel confident about basic skills to see if there are any differences in attitudes towards individual or group participation that required reading or other basic skills.

Implications for Instruction

If the findings from this study show improvement in attitudes and achievement in classes with less than ideal forms of collaboration, the benefits from instruction that more closely follows the collaboration model are likely to show even greater gains. In cases where students are able to engage in topics and concerns that are truly relevant to them,

students are more likely to take responsibility for their learning and become more actively involved, which is witnessed in their behaviors – alertness, excitement, entering into the conversation, questioning, and so forth.

Comments from students from all three classes indicated that interaction with others in the class is important. Students from all three classes indicated that they learned by hearing others in the class/group explain things. This provided a different perspective of the same issue. Different students indicated that hearing a fellow student explain something was more beneficial than hearing it from the instructor. Learning with and from each other is an important consideration in working with adult learners. Instruction for adult learners should provide opportunities to work and learn from each other. Instructors need to provide class time for students to get into small groups, discuss topics that are of real importance to them, have a chance to express their thoughts, to be heard, ask questions and clarify concepts. Adults are social beings and like to be with and learn through opportunities to talk things over with each other. In discussing, arguing, hearing different points of view, they are able to construct their own knowledge on an issue. Instructors need to provide class time for students to work in small groups or in pairs to think aloud, listen, argue, consider different opinions, “try on different viewpoints.” Solving authentic problems from their lives or workplace environment helps students assume ownership of their own learning. Most of the students interviewed said that working in small groups was a good way to learn. They learned by hearing others explain things or hearing things mentioned they hadn’t thought of.

Supportive environments make students feel comfortable and able to take risks needed for learning. Instructors need to develop rapport with students. The comfort level

between students and instructor and students with students is important for learning to take place. Most of the students mentioned that the comfortable feeling in the classroom was one of the most important aspects of their class.

For workplace education classes, it is important to keep the social aspect of learning in mind. Much of the emphasis of workplace training is on high tech, multimedia methods. If computer based instruction is to be used, it is important to accompany this type instruction with group or paired interaction, so concepts can be discussed, compared, and talked through to understanding. There is no substitute for the opportunity to talk through concepts with others. In addition, other benefits of collaboration, such as acceptance of others, working with persons of diverse backgrounds, team work and problem solving come into play.

Summary of Chapter 5

Although not a totally ideal collaborative approach was possible, the results from this study suggest that collaboration is an effective approach for workplace education or other adult instruction. Achievement, as determined by both formal and informal measures, showed that students in collaborative classes learned more of the course content presented. This achievement also included more satisfaction from taking the class by getting what they wanted and achieving their goals. Positive changes in attitudes of participants in the collaborative classes were evident in self-perceptions as team members and problem solvers, as well as learners of English and new things. Some attitudes, such as interest in other classes, did not match expectations because of negative aspects of this one class. Although there were limitations of this study, such as composition of the classes, reasons for attending, and instructor differences, there are clear implications for

providing collaborative opportunities for adult learners. In workplace education, where team work and problem solving are valued and needed, collaboration should be considered as an effective approach.

APPENDIX A

Interview Questions for Students

Interview Questions for Students

1. Tell me three things you liked about this class. Tell me three things you wished were different.
2. What were your expectation at the beginning of this class?
 - A. Did this class meet your expectations? Did you get what you wanted from this class?
 - B. Which expectations were met, which were not?
3. Did you feel the class was helpful to you? How?
4. Did you learn anything? What?
5. What helped you to learn?
 - A. What made learning in this class more difficult?
 - B. What would have made this class better for you? How would you have liked to have it taught?
6. In this class, you worked on the math program on the computer.
 - A. What do you think about this?
 - B. Did you like it/ not like it? Why?
7. Did you feel like you were appreciated as a person in this class? Who appreciated you? What helped you to feel this way?
8. Did you feel you were supported in this class? Who did/did not support you?
9. If you could have worked together with a partner on the math program, do you think that would have been helpful? Why? or Why not?
10. Could what was to be learned in this class be made easier for you to learn in any other way? How?

APPENDIX B

Consent forms filled out by students

I give my consent to Mary Jarvis to tape record my interview. I understand that this tape will be erased after she has transcribed the information onto paper. I understand that I can turn off the tape recorder at any time.

I also understand that any information I provide will be kept confidential and my name will not be used in the transcription.

Signed _____

Date _____

APPENDIX C

Instructor Attitude Survey

Name _____

Instructor Attitude Survey

Please indicate your ranking of each item from 5 = strongly agree, 4 = agree, 3 = somewhat agree, 2 = disagree, and 1 = strongly disagree by placing an "X" on the scale.

- | | | | | | |
|---|---|---|---|---|---|
| 1. A supportive environment in which students feel free to take risks in their learning is important. | 5 | 4 | 3 | 2 | 1 |
| 2. Students learn best when they learn from each other. | 5 | 4 | 3 | 2 | 1 |
| 3. Thinking aloud about how one learns concepts benefits students. | 5 | 4 | 3 | 2 | 1 |
| 4. The instructor needs to know all the answers. | 5 | 4 | 3 | 2 | 1 |
| 5. Students should have a say in the content of the curriculum. | 5 | 4 | 3 | 2 | 1 |
| 6. Learners should feel part of a learning community. | 5 | 4 | 3 | 2 | 1 |
| 7. New concepts should be connected to the learner's prior knowledge. | 5 | 4 | 3 | 2 | 1 |
| 8. Students learn best in small groups. | 5 | 4 | 3 | 2 | 1 |
| 9. Verbal interaction between students and students and students and instructor is important. | 5 | 4 | 3 | 2 | 1 |
| 10. Students should see the "big picture" and understand how concepts presented fit into the "big picture." | 5 | 4 | 3 | 2 | 1 |
| 11. The instructor should provide opportunities for talk among students as part of the learning experience of students. | 5 | 4 | 3 | 2 | 1 |
| 12. The instructor should facilitate a sense of community among students. | 5 | 4 | 3 | 2 | 1 |
| 13. Adult learners possess valuable information from their experiences that instructors should try to draw upon. | 5 | 4 | 3 | 2 | 1 |
| 14. Questions should be used often to see if students know correct answers. | 5 | 4 | 3 | 2 | 1 |
| 15. Questions from students can effectively be redirected to encourage learning from each other. | 5 | 4 | 3 | 2 | 1 |

- | | | | | | |
|---|---|---|---|---|---|
| 16. A test is the most effective way of determining what students have learned. | 5 | 4 | 3 | 2 | 1 |
| 17. The arrangement of the classroom should facilitate interaction of students. | 5 | 4 | 3 | 2 | 1 |
| 18. Materials selected for instruction should come primarily from the workplace. | 5 | 4 | 3 | 2 | 1 |
| 19. Classes should be kept small to facilitate interaction. | 5 | 4 | 3 | 2 | 1 |
| 20. It is a good practice to correct a student as soon as he/she makes a mistake. | 5 | 4 | 3 | 2 | 1 |
| 21. It is important to teach skills that have direct application to the job situation. | 5 | 4 | 3 | 2 | 1 |
| 22. It is necessary for students to hear a new concept presented in several different ways before it becomes their own. | 5 | 4 | 3 | 2 | 1 |
| 23. The physical atmosphere of a classroom has an effect on students | 5 | 4 | 3 | 2 | 1 |
| 24. Students should be expected to use information, not just learn information. | 5 | 4 | 3 | 2 | 1 |
| 25. Evaluating a student's progress is mainly the job of the instructor. | 5 | 4 | 3 | 2 | 1 |

APPENDIX D

Interview Questions for Instructors

Name _____

Instructor Interview about Student Learning

1. How do you think that students learn best?
2. What things can an instructor do to help students learn?
3. What conditions do you feel are important/necessary for student learning?
4. How do you feel about students working together in small groups?
5. What is the best way to know if students are understanding?
6. How can questions can be used in the classroom to help students learn?
7. What do you feel is the role of the instructor in students' learning?
8. What do you like best about your classes?
9. What do you wish were different about your classes?
10. How would your change things if you if you were teach this class again?

APPENDIX E

Customized Pre-Post Tests

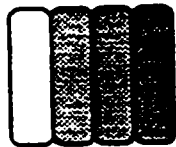
Name
Date

Project ALERT

Mathematics Preview

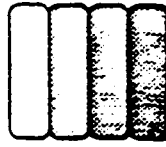
1. Digits are the numerals **0, 1, 2, 3, 4, 5, 6, 7, 8, 9**. The number 854 has three digits. How many digits does the number **34,678** have?
a) two b) three c) four d) five
2. What is the last digit of the number **26,348**?
a) 6 b) 2 c) 8 d) 3
3. In the number **9.8743265**, the nine (**9**) is in the _____ place.
a) ones b) tens c) hundreds d) tenths
4. In the number **9.8743265**, the eight (**8**) is in the _____ place.
a) ones b) tenths c) hundredths d) thousandths
5. In the number **9.8743265**, the seven (**7**) is in the _____ place.
a) ones b) tenths c) hundredths d) thousandths
6. In the number **9.8743265**, the four (**4**) is in the _____ place.
a) tenths
b) hundredths
c) thousandths
d) ten-thousandths
7. In the number **9.8743265**, the three (**3**) is in the _____ place.
a) hundredths
b) thousandths
c) ten-thousandths
d) hundred-thousandths

8. In the number **9.8743265**, the two (2) is in the _____ place.
- thousandths
 - ten-thousandths
 - hundred-thousandths
 - millionths
9. In the number **9.8743265**, the six (6) is in the _____ place.
- thousandths
 - ten-thousandths
 - hundred-thousandths
 - millionths
10. Consider the number place of the **9** in **45.96**. What place value does the nine have?
- $9/10$ (nine tenths)
 - $9/100$ (nine hundredths)
 - $9/10000$ (nine thousandths)
 - $9/10,000$ (nine ten-thousandths)
11. Look at the 3 digit in each number below. Which 3 digit has the **greater value**?
- .3
 - .43
 - .843
 - .5673
12. Read the decimal number **.0042**
- forty-two
 - forty-two hundredths
 - forty-two thousandths
 - forty-two ten-thousandths
13. What fraction is represented by the shaded portion of the picture below?
- $3/4$
 - $1/4$
 - $3/3$
 - $4/3$



14. What part of a fraction does the shaded portion of the picture below represent?

- a) top part
- b) bottom part
- c) middle
- d) none of the above



15. To change a fraction to a decimal, we

- a) divide
- b) add
- c) subtract
- d) multiply

16. Change the fraction $\frac{3}{20}$ (three-twentieths) to a decimal number.

- a) .15
- b) 3.20
- c) 20.3
- d) .51

17. To change a decimal number to a fraction, we must first find the _____ of the last digit.

- a) place value
- b) color
- c) size
- d) none of the above

18. Change the decimal number **.679** to a fraction.

- a) $\frac{6}{79}$
- b) $\frac{679}{1000}$
- c) $\frac{3}{679}$
- d) $\frac{679}{100}$

19. Fill in the blank: $4.3 + 0.05 =$ _____

- a) 12
- b) 4.08
- c) 4.35
- d) 4.305

20. Fill in the blank: $3.6 - .24 =$ _____

- a) 3.36
- b) 1.2
- c) 3.21
- d) none of the above

21. Fill in the blank: $-5.3 + (2.5) =$ _____

- a) -2.8
- b) -3.2
- c) 2.8
- d) 3.2

22. Fill in the blank: $-4.2 - (-3.54) =$ _____

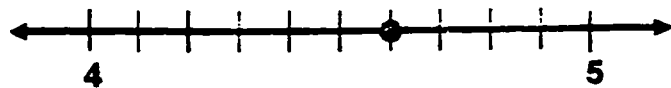
- a) 1.76
- b) -0.66
- c) -1.76
- d) 0.66

23. Fill in the blank: $8 - 6.22 =$ _____

- a) 2.88
- b) 2
- c) 1.78
- d) none of the above

24. The dot on the number line represents what number?

- a) 4.35
- b) 4.0
- c) 4.6
- d) 4.70



25. Which decimal number is larger?

- a) 4.356
- b) 4.02
- c) 4.673
- d) 4.70

26. Which number is probably the width of a strand of hair?
- a) .001
 - b) 1000
 - c) 10
 - d) .0001
27. Which number is larger ? **1356978** or **.556798**
- a) 1356978
 - b) .556798
28. Which of the following is part of the metric system of measurement?
- a) pounds
 - b) feet
 - c) meters
 - d) miles
29. What is the average of the numbers 2, 4, and 6
- a) 12
 - b) 6
 - c) 4
 - d) 3
30. Steven kept a record of his savings for 3 weeks. He saved \$5, \$10, and \$20.
- a) What is Steven's average savings? _____
 - b) What is the range in savings? _____

Problem Solving/Interpersonal Communication Review**Name:** _____**Date:** _____**Code Number** _____**Course Number** _____

1. What is communication? _____

2. Why is clear communication important? _____

3. What is non-verbal communication? _____

4. What is active listening? _____

5. What are two behaviors that improve communication? _____

6. Give an example of a barrier to effective communication? _____

7. How would you define a problem? _____

8. Briefly describe a problem solving technique? _____

9. What is consensus? _____

10. What are two behaviors that contribute to team building? _____

Preview for SPC Prep 2

Name _____ Participant ID # _____
 Project Course # _____ Date _____

1. SPC stands for S _____ P _____ C _____
2. Where did Deming introduce his concepts of SPC to manufacturing?
 - a. Germany
 - b. Japan
 - c. United States
 - d. Sweden
3. Who has the responsibility for quality in your company? _____
4. The 2 kinds of quality that are important to a manufacturer are:
 Quality of _____ Quality of _____
5. Which type of quality from Question 4 is most important for production workers? _____
6. Define *data*. _____

7. In order to make adjustments to a process, what does a machine operator collect? _____
8. What are the four categories used to analyze problems in manufacturing?

9. What is the purpose of putting manufacturing data into tables, charts, and graphs? _____

10. What type of graph is a Pareto chart?
 - a. scatter plot
 - b. Line graph
 - c. bar chart
 - d. pie chart

APPENDIX F

Learner Enrollment and Assessment Forms

OMB No. 1875-0105
Expires Nov. 30, 1997

LEARNER ENROLLMENT FORM

The United States Department of Education is concerned with protecting the privacy of individuals who participate in voluntary surveys. Your responses will be combined with those of other survey participants, and the answers you give will never be identified as yours. This survey is authorized by law (20 U.S.C. 1221e.1). You may skip questions you do not want to answer, however, we hope you will answer as many as you can. It is expected that this form will require approximately 20 minutes to complete. If you have any comments regarding the burden estimates or any other aspect of this collection of information, including suggestions for reducing the burden, please send them to the U.S. Department of Education, Information Management and Compliance Division, Washington, DC 20202-4651; and to the Office of Management and Budget, Paperwork Reduction Project 1875-NEW, Washington, DC 20503.

BEGIN HERE →

YOUR INSTRUCTOR
WILL COMPLETE
THESE QUESTIONS

A. **Course Number:** _____ **Course Name:** _____

B. **Who completed this form?**
(MARK ONE BOX)

The learner

The learner, with assistance from instructor or project staff

An instructor or project staff member with information provided by the learner

Other (*Please Specify:* _____)

C. **Date Form Completed:**

|_|_|_| 19 |_|_|_|
Month Day Year

LEARNER ENROLLMENT FORM

<p>1. Name:</p> <p>_____</p> <p>(Last) (First)</p> <p>2. Social Security Number:*</p> <p>_ _ _ -_ _ -_ _ _ _ </p> <p>3. Age:</p> <p>_ _ years old</p> <p>4. Were you born in the United States?</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No -</p>	<p>5. Sex:</p> <p><input type="checkbox"/> Male</p> <p><input type="checkbox"/> Female</p> <p>6. Are you of Spanish or Hispanic origin or descent?</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>7. Race:</p> <p>(MARK ONE BOX)</p> <p><input type="checkbox"/> White</p> <p><input type="checkbox"/> Black (African American)</p> <p><input type="checkbox"/> Asian or Pacific Islander</p> <p><input type="checkbox"/> American Indian or Alaskan Native</p> <p><input type="checkbox"/> Other (Please Specify: _____)</p>
--	---

* Giving us your Social Security number is completely voluntary and there is no penalty for not disclosing it. It is needed so that any information obtained later gets correctly matched with the same individual; your identity will be removed from all records once this match is made. We are authorized to ask these questions by Section 406 of the General Education Provisions Act (20 USC 1221e 1)

8. Is English the language that is spoken most often in your home?

Yes

No

9. How many years of school have you completed?

(MARK ONE BOX IN BOTH COLUMNS)

In the United States:

No schooling

1-5 years

6-8 years

9 years

10 years

11 years

12 or more years

In Any Other Country:

No schooling

1-5 years

6-8 years

9 years

10 years

11 years

12 or more years

10. Are you a union member?

Yes → What is the name of your union?

No _____

11. Please rate your ability to perform each of the following activities.

(PLEASE MARK ONE RESPONSE FOR EVERY ACTIVITY)

	<u>Poor</u>	<u>Fair</u>	<u>Good</u>	<u>Excellent</u>
Read English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Understand English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Speak English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Write in English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work as part of a team	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solve problems/use reasoning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Do you have a job?

- Yes, employed → **GO TO NEXT PAGE**
- Yes, on temporary layoff
- No, retired →
- No, not employed

INSTRUCTIONS:

Please answer questions 13-19 for the job that allows you to take this course.

13. Name of company or employer:

--	--	--	--	--

(For project use only)

14. Job title: [For example, nursing assistant, housekeeper, construction worker.]

15. On average, how many hours per week do you work on this job?

|__|__| Hours Per Week

16. How much do you earn at this job?

(WRITE AMOUNT AND MARK ONE BOX)

\$ _____ Per hour
 Per year

17. Do you get any of the following at this job?

(MARK ONE FOR EACH LINE)

	<u>Yes</u>	<u>No</u>
Paid vacation	<input type="checkbox"/>	<input type="checkbox"/>
Paid sick leave	<input type="checkbox"/>	<input type="checkbox"/>
Paid holidays	<input type="checkbox"/>	<input type="checkbox"/>
Health insurance	<input type="checkbox"/>	<input type="checkbox"/>

18. How long have you worked at this job?

and
 Years Months

19. At your job do you need to do any of the following?

(MARK ONE FOR EACH LINE)

	<u>Yes</u>	<u>No</u>
Read instructions	<input type="checkbox"/>	<input type="checkbox"/>
Receive spoken instructions in English	<input type="checkbox"/>	<input type="checkbox"/>
Speak English	<input type="checkbox"/>	<input type="checkbox"/>
Work as part of a team	<input type="checkbox"/>	<input type="checkbox"/>
Write in English	<input type="checkbox"/>	<input type="checkbox"/>
Use math	<input type="checkbox"/>	<input type="checkbox"/>
Solve problems/use reasoning	<input type="checkbox"/>	<input type="checkbox"/>

20. Do you work at more than one job?

- Yes
- No

Learner Enrollment Form

21. How many years since you have had formal schooling? _____ years

22. Educational background: (Check those that apply)

____ High school graduate

____ GED

____ Some college- Number of courses completed _____

____ College degree Degree earned _____

____ Trade/Vocational school - - - - Number of courses completed _____
Certificate _____

23. Have you held other jobs here? (Circle one) No Yes

If yes, list other jobs and number of years/months on each.

_____ years/months

_____ years/months

_____ years/months

24. Have you done this kind of work at other companies? (Circle one) No Yes

If yes, how many years? _____

25. Did you have any training connected with this job? (Circle one) No Yes

If yes, What training?

When did it occur? _____

How was the training conducted? (Circle those that apply)

Small group

Instructor led

Video

Individual

Computer-based

Other _____

Was the training helpful? (Circle one) Yes No

Comments: _____

What did you like best about the training?: _____

Learner Enrollment Form

Example: Summer is my favorite season. almost always usually frequently sometimes almost never
 Questions 26-32 are about the job you do here.

26. I am satisfied with my job. almost always usually frequently sometimes almost never
27. I am satisfied with my job performance almost always usually frequently sometimes almost never
28. I feel cared about by upper management. almost always usually frequently sometimes almost never
29. I think my work area supervisor understands what it takes to do my job. almost always usually frequently sometimes almost never
30. I feel that my cultural background is accepted here. almost always usually frequently sometimes almost never
31. I believe that technology is changing my job. almost always usually frequently sometimes almost never
32. I enjoy learning new things that will help me with my job. almost always usually frequently sometimes almost never

Questions 33-40 are about your life in general.

33. I am a good test taker. almost always usually frequently sometimes almost never
34. I learn new things easily. almost always usually frequently sometimes almost never
35. I am good at reading. almost always usually frequently sometimes almost never
36. I am good at writing. almost always usually frequently sometimes almost never
37. I am good at math. almost always usually frequently sometimes almost never
38. I think I am computer literate. almost always usually frequently sometimes almost never
39. I like using computers. almost always usually frequently sometimes almost never
40. I use a computer at home. almost always usually frequently sometimes almost never

Thank you. You have completed this form. Please return it to your instructor.

LEARNER ASSESSMENT FORM

The United States Department of Education is concerned with protecting the privacy of individuals who participate in voluntary surveys. Your responses will be combined with those of other survey participants, and the answers you give will never be identified as yours. This survey is authorized by law (20 U.S.C. 1221e.1). You may skip questions you do not want to answer, however, we hope you will answer as many as you can. It is expected that this form will require approximately 10 minutes to complete. If you have any comments regarding the burden estimates or any other aspect of this collection of information, including suggestions for reducing the burden, please send them to the U.S. Department of Education, Information Management and Compliance Division, Washington, DC 20202-4651; and to the Office of Management and Budget, Paperwork Reduction Project 1875-NEW, Washington, DC 20503.

BEGIN HERE _____

**YOUR INSTRUCTOR
WILL COMPLETE
THESE QUESTIONS**



A.	Course Number: _____	Course Name: _____
B.	Who completed this form? (MARK ONE BOX) <input type="checkbox"/> The learner <input type="checkbox"/> The learner, with assistance from instructor or project staff <input type="checkbox"/> An instructor or project staff member with information provided by the learner <input type="checkbox"/> Other (Please Specify: _____)	
C.	Date Form Completed: _ _ _ _ _ 19 _ _ _ Month Day Year	

1. Name:

Last: _____

First: _____

2. Social Security Number: *

3. In the future, do you plan to take any of the following courses?

(MARK ONE ON EACH LINE)

	Plan to <u>Take</u>	Do <u>Not</u> Plan to <u>Take</u>
A basic skills course in reading, writing, or math	<input type="checkbox"/>	<input type="checkbox"/>
A course in using English (such as ESL)	<input type="checkbox"/>	<input type="checkbox"/>
A computer course	<input type="checkbox"/>	<input type="checkbox"/>
A GED course or the GED exam	<input type="checkbox"/>	<input type="checkbox"/>
Courses to get an occupational certificate	<input type="checkbox"/>	<input type="checkbox"/>
A job training course	<input type="checkbox"/>	<input type="checkbox"/>
Courses leading to a 2-year or 4-year college degree	<input type="checkbox"/>	<input type="checkbox"/>
A home-study course	<input type="checkbox"/>	<input type="checkbox"/>

Giving us your Social Security number is completely voluntary and there is no penalty for not disclosing it. It is needed so that any information obtained later gets correctly matched with the same individual; your identity will be removed from all records once this match is made. We are authorized to ask these questions by Section 406 of the General Education Provisions Act (20 USC 1221e-1).

4. Since this course began, have you:

MARK ONE ON EACH LINE:

	<u>Yes</u>	<u>No</u>
Learned what you wanted to learn in this course?	-	-
Changed your educational or career goals?	-	-
Had more responsibility added to your job?	-	-
Moved to a shift you prefer?	-	-
Switched from part-time to full-time?	-	-
Received a pay raise?	-	-
Been promoted?	-	-
Received an award, bonus, or other special recognition on your job?	-	-
Received your GED?	-	-
Applied for a new job?	-	-
Started a new job at another company?	-	-
Been laid off?	-	-
Left your job for any other reason? <i>(Please Specify:</i>	-	-

5. Please rate your ability to perform each of the following activities:

(PLEASE MARK ONE RESPONSE FOR EVERY ACTIVITY)

	<u>Poor</u>	<u>Fair</u>	<u>Good</u>	<u>Excellent</u>
Read English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Understand English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Speak English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Write in English	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work as part of a team	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solve problems/use reasoning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Student Assessment Form

For the following questions, circle ONE response for each statement.

Example: Winter is my favorite season. almost always usually frequently sometimes almost never

Questions 6-12 are about the job you do here.

6. I am satisfied with my job. almost always usually frequently sometimes almost never
7. I am satisfied with my job performance. almost always usually frequently sometimes almost never
8. I feel cared about by upper management. almost always usually frequently sometimes almost never
9. I think my work area supervisor understands what it takes to do my job. almost always usually frequently sometimes almost never
10. I feel that my cultural background is accepted here. almost always usually frequently sometimes almost never
11. I believe that technology is changing my job. almost always usually frequently sometimes almost never
12. I enjoy learning new things that will help me with my job. almost always usually frequently sometimes almost never

Question 13-20 are about your life in general.

13. I am a good test taker. almost always usually frequently sometimes almost never
14. I learn new things easily. almost always usually frequently sometimes almost never
15. I am good at reading. almost always usually frequently sometimes almost never
16. I am good at writing. almost always usually frequently sometimes almost never
17. I am good at math. almost always usually frequently sometimes almost never
18. I think I am computer literate. almost always usually frequently sometimes almost never
19. I like using computers. almost always usually frequently sometimes almost never
20. I use a computer at home. almost always usually frequently sometimes almost never

Thank you. You have completed this form. Please return it to your instructor.

level.

APPENDIX G

Learner Expectation Summary

Learner Expectation Summary

Please complete this form up to the dotted line when you begin a course.

Name _____ Date _____

Course name _____ Class time days _____

Job title _____ Male Female

English spoken at home? Yes No If no, what language is spoken at home? _____

(Check the area in which you are most interested.)

- | | |
|---|---|
| <input type="checkbox"/> Math Improvement | <input type="checkbox"/> Reading, Writing Improvement |
| <input type="checkbox"/> Communication skills improvement | <input type="checkbox"/> Test-taking skills |
| <input type="checkbox"/> Computer skills | <input type="checkbox"/> Other (What?) _____ |

Specifically, what would you like to improve? _____

Please complete the bottom of this form when you have completed a course.

Did you learn what you expected to? Yes Almost Some No

If not, why? Absence
 Didn't understand the work
 Time schedule/ work and school
 Other _____

Would you be interested in other courses? Yes No

If yes, what would you like to learn next? _____

APPENDIX H

Participant Survey

PROJECT ALERT PARTICIPANT SURVEY**Course Name** _____**Date** _____

Thank you for taking time to give us your opinions. This information will help us understand changes we need to make in this course.

What was this course mostly about?**What was the most important thing you learned in this course?****What did you like most about this course?****What did you like least about this course?****Other comments.**

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ABSTRACT

IMPACT OF COLLABORATIVE APPROACH IN WORKPLACE EDUCATION CLASSES ON PARTICIPANTS' ACHIEVEMENT AND ATTITUDES

by

MARY I. JARVIS

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Advisor: Dr. Karen Feathers

Major: Reading

Degree: Doctor of Education

Collaborative instructional approaches have been used effectively in elementary and secondary classes, but there is little that indicates whether collaboration can be successful in workplace classes. This study compared three workplace education classes, two collaborative classrooms and a non-collaborative classroom, to determine the efficacy of such an approach. Both qualitative and quantitative measures were used to determine the effectiveness of collaboration. Instructors' beliefs and attitudes regarding instruction, student learning and classroom environment, as determined by instructor surveys and interviews, were compared with actual classroom observations. T-tests of pre-post content tests were compared with participant surveys, interviews and observations to determine the effects of collaboration on students' learning and changes in students' attitudes

Achievement showed that students in collaborative classes learned more than those in less collaborative classes. These participants also were more satisfied with their class. Participants in the collaborative classes had more positive perceptions of their ability to learn, participate in teamwork and solve problems. Although this study is limited by the size and composition of the classes, the results suggest that clear implications for providing

collaborative instructional opportunities for adult learners are effective, especially in workplace education, where team work and problem solving are valued and needed.

Autobiographical Statement

Mary Jarvis received a scholarship to Bowling Green State University in Ohio for two years of schooling and then was hired at a time when teachers were in great demand, in the mid-fifties. She finished her degree from Bowling Green in the early sixties by attending summer school each summer. For ten years she taught first to fourth grades in elementary schools in Ohio, Michigan and California. She finished her Master's degree from University of Michigan in the mid- sixties, just before her firstborn was born. She spent the next twenty years applying what she learned raising her three children, while also serving as scout leader, 4-H leader, League of Women chairman, and school and church volunteer. In 1985 she began taking classes at Wayne State University, Detroit MI with reading as her major and a cognate in Curriculum. When she received her Specialist in Education she began teaching for Wayne State as adjunct faculty. For three years, she taught pre-student teachers and supervised them in their field experiences. She was then hired for two years as a Graduate Research Assistant on Project ALERT, a U. S. Department of Education grant project for workplace literacy. It was at this time that she became interested in workplace education classes and began work on her dissertation. After that project ended, she switched to another workplace literacy project, called *Innovative Workplace Literacy*, a U. S. Department of Housing and Development grant project addressing the literacy and work skills needs of residents and workers in the Empowerment Zone, a distressed area in Detroit. During the time she was involved in workplace education, she made several presentations at conferences and wrote an article that was published in ERIC regarding development of Whole Language curriculum for workplace education classes. She was recently awarded a grant from the Michigan Council for Learning Adults for determining communication needs for the workplace in a Spanish manufacturing center.