

JITE v36n2 - Skill and Knowledge Acquisition in the Workplace: A Case Study of Mentor-Apprentice Relations in Youth Apprenticeship Programs

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Conceptual Framework

Youth apprenticeship programs are designed to place students in a community of expert practitioners where they have an opportunity to learn the work and social skills needed to become effective and productive workers in today's competitive market place. Dewey advocated this form of education during the late 1800s when he suggested that education should take place within the community rather than in isolation from the community (Lerwick, 1979). Similarly, Vygotsky (1978) identified social institutions, culture, activities, and cognition as critical elements of a successful learning process. Vygotsky hypothesized that learning occurs most effectively when it is relevant and meaningful to the completion of activities found in a particular culture or society.

Dewey and Vygotsky's psychological research led others to explore the effect of natural events and settings on learning. This line of research has developed a conceptual base often referred to as situated cognition theory. Situated cognition theory states that whenever possible, learning should occur within a specific context and should attempt to replicate as closely as possible the practices used in that context (Brown, Collins, & Duguid, 1989; Collins, Hawkins, & Carver, 1991; Lave & Wenger, 1991). Social aspects of learning are very important from a situated cognition perspective (Lave, 1988). In fact, Resnick (1991) argued that "the social context in which cognitive activity takes place is an integral part of that activity, not just the surrounding context for it" (p. 4).

Situated cognition theory of learning contains several components related to teaching and learning including: the use of authentic activities (Brown, et al., 1989; Resnick, 1987), allowing novice workers to observe and model expert behavior to attain mastery and understanding (Bruer, 1993; Perkins & Salomon, 1989), gradually increasing the level of individual participation in group activities, i.e., legitimate peripheral participation (Lave & Wenger, 1991; Scribner, 1985), and use of ill-structured settings to enhance the possibilities of learning transfer (Berryman & Bailey, 1992; Cormier & Hagman, 1987; Lave, 1988). The notion of cognitive apprenticeship is related to situated cognition theory and simulates or capitalizes on real-world activities (Berryman & Bailey, 1992; Brown, et al., 1989; Collins, Brown, & Newman, 1989; Collins, et al., 1991). Cognitive apprenticeship models use a variety of techniques designed to enhance instruction including modeling, coaching, scaffolding and fading, articulation, reflection, and exploration.

An additional component essential to youth apprenticeship programs is mentoring. In traditional apprenticeship programs, an experienced mentor works with a novice apprentice to teach the correct procedures associated with a skill or craft (Murray, 1991). This method of instruction has remained fairly constant through the years. Then, as well as now, a mentor's primary responsibility was to teach an apprentice the skills needed to complete a product or process. Hamilton (1989) described additional behaviors that mentors may display when working with a youth apprentice including to: (a) instruct a learner how to perform a task, (b) demonstrate how a task is performed, (c) coach a learner as the task is being performed, (d) explain why a task is done in a particular way, (e) challenge a learner to perform well, (f) initiate a learner into the culture of a work organization, and (g) affirm a learner's value as a person and talent as a worker. Given this list of responsibilities, a mentor's role is an integral and crucial component in youth apprenticeship programs.

Method

A qualitative case study design was used to explore, interpret, and describe experiences and interactions between mentors and youth apprentices in the workplace. The case study design was selected for several reasons. First, case study research "seeks to understand specific issues and problems of practice" (Merriam, 1988, p. 23) through a detailed examination of a specific group of people, a particular organization, or a selected activity (Bogdan & Biklen, 1998). Secondly, it was important for us to see and understand the types of interactions that occur between mentors and apprentices in workplace settings. According to Stake (1994), "caseworkers seek to see what is natural in happenings, in settings, in expression of value. What the researchers are unable to see for themselves is obtained by interviewing people who did see or by finding documents recording it" (p. 242).

Case selection was an important factor in this research. We began by identifying possible case sites, in conjunction with a local youth apprenticeship coordinator, that we believed would be receptive to our research and observations. The apprenticeship coordinator contacted site representatives to determine their willingness to participate. After this initial request, each site representative was contacted to explain the project. Initially, six sites were identified. However, after visiting each site on several occasions, two sites were selected for in-depth study; a school district computer repair office and an automotive dealership. These two sites offered the greatest opportunities for observations and interviews. These sites also appeared to offer a greater diversity of work tasks for youth apprentices and mentors, thereby allowing observations of a variety of situations.

To guide data collection, a constructivist paradigm was followed. Similar to situated cognition, constructivism asserts that knowledge is an individual and social process (Schwandt, 1994). This paradigm supported our selection of sites based on a priori criteria including diverse and varied work experiences and accessibility.

Site and Sample Selection

Through a purposive search we identified a secondary-based youth apprenticeship program located in a rural community in South Carolina. The apprenticeship program was administered from an area vocational/career center which served approximately 1,000 eleventh and twelfth grade students from four area high schools. While in high school, students enrolled in either a college preparatory curriculum located at their home high school or in a Tech Prep, occupational, or technical training program located at the area career center. If students chose a vocational curriculum, they became eligible to apply for participation in the apprenticeship program. Eligibility for the apprenticeship program included: (a) a desire to participate, (b) a minimum cumulative grade point average (GPA) of C in all coursework, (c) a minimum GPA of B in career center courses, (d) less than 10 school absences, (e) completion of the Career Ability Placement Survey (CAPS), (f) the ability to meet entrance requirements at state postsecondary technical institutes, and (g) the written recommendation of a career center instructor. Of all of the requirements, a teacher's recommendation was considered the most important.

The career center offered 16 different vocational programs ranging from traditional programs like culinary arts, masonry, and carpentry to other offerings such as computer electronics, graphic arts, and business management. The school maintained six apprenticeship sites that consisted of three manufacturing companies (capacitor, power hand tools, and yarn), a computer electronics company, the local school district computer repair office, and an automotive dealership. Apprentices typically worked 20 hours per week and earned between \$5.00-\$7.00 per hour.

Students initially considered for inclusion in this study were enrolled in business management, computer electronics, and automotive mechanics programs at the career center. Each work site representative who hired an apprentice assigned one employee as mentor, except at the district computer repair office where two mentors were assigned.

Site selection involved first determining which site representatives would be willing to participate. And, since case study research seeks to learn as much as possible about particular sites, a major issue in site selection was identifying those representatives who would allow us to spend as much time as possible at the site (Stake, 1994).

Another issue we considered during initial site selection was the mentor. At the two sites eventually selected, the mentors appeared to be willing to work with apprentices in order to help them learn not only the technical aspects of the job, but the social aspects as well. Mentors at our selected sites also seemed to provide their apprentices with greater responsibilities and freedom to solve problems independently. The mentor at the automotive dealership and mentors at the school district computer repair office allowed their apprentices to work independently on a variety of tasks. Apprentices were allowed and encouraged to try new things on their own before asking for assistance. These mentors believed that trial and error was an important way for young novice workers to learn.

In contrast to selected apprenticeship sites, non-selected sites did not provide meaningful and educational tasks. Rather, mentors at the four sites not selected for involvement often wanted their apprentices to perform repetitive, non-skilled tasks. An apprentice at one of these sites felt she was only there to do the boring, run-of-the-mill tasks that no one else wanted to do. Furthermore, non-selected sites did not seem to have mentors who would take an active role in assisting apprentices. These mentors offered little in the way of guidance and supervision during initial visits.

Apprenticeship Sites and Participants

School District Computer Repair Office

The local school district computer repair office was a fairly small operation, employing five people including the two repair persons who served as mentors, Norman and Don, and the apprentice, Chris. Norman was a very organized person and liked to have a place for everything and everything in its place. Norman worked mostly with computer software applications for computers. Don, on the other hand, appeared to be fairly unorganized and often seemed to be doing 10 things at once. Don focused more on hardware and repair of computer equipment. Chris, the apprentice, was a large girl with olive colored skin and long, thick hair. Chris worked mainly with Don on computer equipment repairs. This line of work corresponded with what Chris did at the career center in her computer electronics classes (Interview, 5/28/94). Norman usually went to the local schools to install software or hardware and to assist teachers in learning how to use the equipment properly. Don accompanied him if they thought there was trouble related to the equipment. When problems were minor, the equipment could be repaired on site. However, if the problem was not immediately identifiable or if it was major, the unit was brought to the office for repair. Chris rarely went to the schools with Norman and Don because of a concern about the school district's liability in case of an accident (Field notes, 4/19/94).

In the beginning, Norman and Don were generally pleased with Chris' progress. According to Don, "we've only been involved with the program now for about nine weeks. I've written up a performance review on her [Chris] just a few weeks ago and gave it to her and gave her pretty good marks on just about everything that we were able to address" (Interview, 5/28/94). The main concern Norman and Don had at that time was that Chris had not learned much about software applications in the career center program. Norman and Don did not appear to be upset by this deficit. They stated that even in their formal vocational training they did not learn about the software aspects of computers until they were in the workforce.

Although Norman and Don initially gave Chris good reviews, after four months they terminated her apprenticeship due to what they considered to be excessive absences. According to Don, Chris did not know what constituted a legitimate reason for missing work (Field notes, 8/1/94). In a later conversation with Don and Norman, they acknowledged that Chris had been absent for unrealistic reasons from the very beginning. They cited examples of her taking 3 days to recover from a minor traffic accident, calling in sick because she was tired, and missing work because her father's friend had surgery (Field notes, 5/17/95).

The dismissal of Chris did not discourage Norman and Don. In less than a month they had a new apprentice, Dale, who was hired for the same job duties and was enrolled in computer electronics at the career center. He was an extremely bright teen with blond hair, blue eyes, and aspirations to further his education. Not only did he work with the school district repairing computers, he also had a part-time job working at a local fast food restaurant.

Unlike Chris, Dale never missed a day of work without a legitimate reason, such as taking an exam at school. Don and Norman talked about the differences between Chris and Dale. They stated that Dale had also been in a minor traffic accident on his way to school one morning. However, unlike Chris who took days to recover, Dale was at work that afternoon. Don laughed when he said that Dale could make him look bad if he was so unfortunate as to have a minor accident--he would have to come to work because Dale did (Field notes, 5/17/95).

The mentor-mentee team of Dale and Don participated in this case study. This site was retained because of a willingness to participate and the access we were given

Automobile Dealership

The second site selected for this study was an automobile dealership where the apprentice, Michael, worked as a diesel mechanic in the automobile repair shop. Michael had already graduated from high school where he completed the career center's automobile mechanics program. He was a handsome young man with blond hair and blue eyes. John, his mentor, was a short, bearded man in his late 40s. John and Michael were both from the local area. Although these two were friends and neighbors, they had some interesting differences. John smoked, cussed, and enjoyed a beer or two after work. Michael dipped snuff or chewed tobacco, had never been heard saying a cuss word, and did not care for alcohol. Both men took great pride in their work. Everyone working at this site was fairly specialized. One mechanic focused on engine tune-ups, another driveability (which has to do with the electrical system of a car and was a job where you did not get dirty), another did front end alignments, and another worked with transmissions. Michael and John were unique in that they did all aspects of vehicle work on diesel engines.

The first observations at the mechanics shop were somewhat awkward. This was a male-dominated environment and, as a female, the principal author received plenty of attention. However, as time progressed, the workers became accustomed to the presence of the female researcher. In fact, several made it a point to talk during breaks. The mechanics at this site accepted Michael as a knowledgeable, but novice, mechanic. If John was busy or out on a service call, the other mechanics would offer assistance to Michael if needed. Although sometimes hectic, this site provided interesting data and proved to be a worthwhile and exciting place to visit.

Other Sites Considered

Yarn manufacturing plant. This apprenticeship site was a major yarn manufacturing plant that converted raw materials into yarn for knitting and crocheting. The plant employed one apprentice, Sharon, who worked in the business office and was enrolled in the business education program at the career center. Sharon's job tasks were typical of most office environments--filing, computer data entry, record keeping, typing memos, and the like. Unfortunately, Sharon was laid off shortly after this study started due to cut backs at the plant. Since there was no longer an apprentice at this location and there was no plan to hire another apprentice, data collection ceased.

Hand power tool manufacturing company. The next site was a hand power tool manufacturing company that employed 1,600 workers of varying ages and educational backgrounds. The plant produced internal and external components of many power hand tools such as sanders, drills, and circular saws. The company operated three shifts, producing individual parts, assembling components, and shipping power hand tools. This company was the first in the area to become involved in the youth apprenticeship program.

According to Robert, the personnel supervisor (but not the mentor), Gary had just been hired as a youth apprentice and, at the start, did quite well. Unfortunately, he began to associate himself with a group of adolescents who did not always do the right thing. After working at the plant for about two months, he was fired due to legal trouble. Gary and his family soon moved out of the area and contact with him was lost. As a result, this site was not retained for long term observations.

Capacitor manufacturing plant. Another apprenticeship site was a capacitor manufacturing company. The apprentice, Susan, worked in the personnel office under the direction of her mentor who was also the personnel director. While several casual observation periods were scheduled, no formal interviews or observations occurred due to the lack of cooperation given from the mentor. After repeated attempts to secure interview and observation appointments, this site was dropped from further involvement.

Small computer manufacturing business. This small computer company was highly specialized. Employees custom-built computers designed for purposes specified by their customers. Approximately 20 employees worked at the company including Stephen, the apprentice. Unfortunately, this site did not remain in the study long. After gaining entry, Stephen was observed at work only once. It was apparent that he was not happy working there. He stated that the company representatives had drastically cut his hours, which made him unhappy. In fact, when things were slow, they only asked full-time, regular employees to come to work and that left Stephen out. Unfortunately, there was never an opportunity to talk to Stephen's mentor about this situation, specifically the notion of **regular** employee as opposed to youth apprentice.

Procedures

A qualitative case study design was used to interpret and explore interactions between mentors and youth apprentices. Two interactive methods (participant observation and interview) and one noninteractive method (document analysis) were selected to aid in data collection (LeCompte & Preissle, 1993). Participant observation allowed us to gather impressions of situations firsthand, from an insider's point of view, and record behavior as it occurred (Adler & Adler, 1994; Merriam, 1988). Participant observation was also a valuable method for triangulation of data by allowing the researcher to check for accuracy and consistency of information obtained from other data collection methods such as interviews and documents (Adler & Adler, 1994). Participant observation lets researchers observe who and what is involved, where and when events occur, how and why events occur, and to feel or sense what is to be felt or sensed in a situation. Participant observation may be used as a method of data collection to allow researchers to experience a program or situation from an insider's viewpoint. Participant observation allows researchers to see behaviors and actions as they occur rather than relying solely on accounts from interviews. This method is particularly useful when little is known about a phenomenon, when participants are unable or unwilling to be interviewed, or when human interactions are of interest (Jorgensen, 1989; Merriam, 1988). The amount of researcher involvement may vary from complete participation, i.e., the researcher becomes an active member of the group being studied, to complete observation, i.e., the researcher remains detached from the group (Jorgensen, 1989; Merriam, 1988; Patton, 1990).

In this research study, the role of a nonparticipant observer was adopted (Merriam, 1988). A nonparticipant observer is present in a situation, but remains uninvolved in the activities so as to maintain the role of researcher. Participants knew and understood why the researcher was there. However, the primary role of the researcher was to gather data rather than to participate in apprentice-related activities.

Another consideration when using participant observation for data collection is determining what to observe in the field. Merriam (1988) cited several factors that may be observed including the setting, participants, activities and interactions, frequency and duration of tasks, and subtle factors, i.e., informal activities, connotative meanings of words, and nonverbal communication. In this study, the physical settings, actions of participants, actions and interactions between participants, and subtle factors such as use of work-related terms, nonverbal communication, and unusual activities or events were observed. Data from observations were gathered approximately once a month from each business. Because these were fully operating businesses, observation times were generally limited to approximately one hour per visit. Time of day for observations varied between businesses. Observations at the school district computer repair office occurred in the afternoons because the apprentice was in school in the morning. Observations at the automobile dealership were also in the afternoon because that was what they requested.

Participant observation, although highly effective and useful, has limitations. Critics of participant observation maintain that it is a highly subjective method because of the unreliable nature of human perception (Merriam, 1988). Furthermore, participant observation allows researchers to only observe external behaviors and actions of participants (Merriam, 1988; Patton, 1990). One strategy used in this study for reducing these limitations was to conduct observations over time in order to observe varying conditions (Adler & Adler, 1994). By doing this, the data could be searched for similar and dissimilar findings at different times during the process. Furthermore, observations that were unclear or confusing could be validated through interview questions.

Interviews were used to determine what was on participants' minds (Patton, 1990). They also served to validate our observations with participants' perceptions of the same events. Interviews are a face-to-face questioning of participants for gathering data (LeCompte & Preissle, 1993). Interviews attempt to "find out what is in and on someone else's mind" (Patton, 1990, p. 278). Interviewing is especially useful when behaviors, feelings, attitudes, or interpretations of people cannot be directly observed (Merriam, 1988).

Interviews vary in type from highly structured to conversational formats. Highly structured interviews seek to ensure that comparable information is obtained from all participants by having each participant answer the same questions, usually asked in the same order each time. In contrast, conversational interviews are more spontaneous and occur from a natural flow of interaction between interviewer and participant. This study utilized semi-structured interviews; the same basic questions were asked of all participants but not necessarily with the same wording or in the same order (see Appendix). This allowed for the possibility of greater flexibility and in-depth conversation between interviewer and participants. Questions for the interviews were derived from our research questions and on the literature concerning work-based learning. Interview questions for mentors and apprentices focused on the experiences and interactions that occurred between the two individuals. To ensure that the information was accurate and complete, an audio tape recorder was used during each interview and backup notes were taken in case the tape recorder malfunctioned.

Whatever the type of interview used, the quality of data obtained from an interview is highly dependent on the skills of the interviewer and participant. Therefore, it was essential that certain procedures and guidelines were followed. The protocol for this study included asking specific questions concerning participants' experiences and behaviors in the youth apprenticeship program, opinions of the program, and feelings regarding the program.

Interviews, as with other forms of data collection, have limitations. These limitations include the subjectivity of the researcher, possible distortion of data because of false or misleading data, biases of both interviewer and interviewee, and a lack of information forthcoming from interviewees. Each of these limitations can be reduced by a careful selection of interviewees and questions, and by the interviewer refraining from arguing, being sensitive to verbal and nonverbal messages from interviewees, and being a reflective listener (Merriam, 1988). To reduce distortions of data, the interviewer spoke only to ask questions or to clarify answers and listened for statements that were interesting and needed elaboration.

Documents are usually written materials (e.g., public or archival records, personal documents, and physical traces) and can provide a rich source of information (Merriam, 1988). Merriam described three major types of documents--public or archival records, personal documents, and physical traces. Public records include birth and death certificates, school records, marriage licenses, police and court records, mass media, and previous research. Personal documents include diaries, scrapbooks, letters, and photo albums or home videos. Physical traces, although these may or may not be in the form of a written document, include items that can be measured for frequency (e.g., number of parts assembled, degree of wear on a building or its equipment).

This study relied mainly on public records or documents because they contained information most useful. Grades, student evaluations, program records, and program guidelines provided information about students or programs. The program coordinator granted permission to review and use student apprentice evaluations completed by business personnel, a mentor survey conducted by the coordinator, and results from a national survey asking students to rate the program. The program coordinator also provided documents used for program participants (e.g., overview of program, mentor guide, student handbook).

As with other methods, document analysis has limitations. One limitation is the difficulty sometimes encountered when determining the accuracy and authenticity of a document (Merriam, 1988). In addition, because documents are produced for specific purposes, there may be difficulty understanding information contained in the document. This lack of understanding can be a result of the researcher being an outsider with little or no context for understanding. To guard against limitations, we asked questions of any unclear items in the documents and checked with the youth apprenticeship coordinator to determine the accuracy and authenticity of the documents.

Regardless of limitations, documents provide a valuable and readily available source of information (Lincoln & Guba, 1985). Documents are a stable source of information since researcher presence does not alter the information contained in documents. Program documents obtained from the career center, which included workplace competencies guidelines, a student handbook, a mentor guidebook, and an overview booklet were used to compare what was discovered through observations and interviews with information contained in the documents. More specifically, the workplace competencies were used to compare the observed tasks performed at work with the competencies outlined by career center instructors. The student handbook was reviewed to determine what information apprentices received before they began their work experience. The mentor guidebook was used to compare mentor's responses to interview questions with the program objectives, role of a mentor, and tips for mentors outlined in the guide. The overview handbook provided background information about the program and described how and why the program was developed. These documents were reviewed after completion of observations and interviews so that the researcher could compare what was seen and heard with what was documented. Documents revealed that mentors generally adhered to the mentoring program objectives (i.e., to help the apprentice achieve educational or career goals and assist the apprentice in achieving acceptable levels of competencies), conformed to the role of the mentor as outlined in the guidebook (i.e., provide academic support, serve as a role model, show concern, give attention, communicate with the apprentice, and inform the apprentice of company policy), and used many of the tips listed to assist apprentices in gaining skills and knowledge related to their area of study (i.e., explain and show the skill to be learned, have the apprentice show the skill to the mentor, have the apprentice teach the mentor the skill, and teach the apprentice how to evaluate his/her performance).

This study began when the youth apprenticeship coordinator at the career center was contacted. After gaining approval from businesses and the school district, data collection began in spring and continued for an entire year. Interviews were conducted at times convenient to participants and usually lasted about one hour. On-site data collection was augmented by analysis on written documents obtained from the career center such as the workplace competencies guidelines, student handbook, mentor guidebook, and overview of program booklet. According to Lincoln and Guba (1985), data collection is complete when the following guidelines are met: exhaustion of sources, saturation of categories, emergence of regularities, and over-extension (i.e., information being collected is not relevant to the study). Data collection was complete when we began to hear and see commonalities, recurrences, and redundancies in the data (Bogdan & Biklen, 1998). Once data collection was complete, the information was organized in preparation for intensive analysis (Merriam, 1988).

Analysis involved searching the data for emerging themes and then separating the data into categories associated with those themes. Data analysis began by reviewing the purpose of this study, which was to explore, discover, and describe learning and teaching experiences that occurred between a mentor and an apprentice. Two broad categories, learning and instruction, and the apprenticeship program, were established. Under the heading of learning and instruction, the following detailed categories emerged: tasks performed at work, interactions and teaching methods used by mentors, work-based learning, school-based learning, and work ethics and social behaviors. Under the heading of the apprenticeship program, the following detailed categories emerged: participants' views of the program, benefits of the program, and written documents compared to the data.

Data Analysis Procedures

Data analysis was an ongoing process. Preliminary analysis began in the field collecting data. However, intensive analysis began when all data collection was completed. Intensive analysis required that collected data be organized in some way. Intensive data analysis began by first reviewing the purpose of this study, which was to explore, discover, and describe experiences and interactions that occurred between mentors and apprentices. Using the research objectives as initial guides allowed us to search the data for broad categories. These broad categories then funneled down into smaller, more exclusive categories. Final categories included tasks performed at work, interactions and teaching methods used by mentors, work-based learning, school-based learning, work ethics and social behaviors, participants' views of the program, problems with the program, benefits of the program, and written documents compared to the data. These categories were derived through analysis of field notes, interviews, and documents. Categories were determined using the following guidelines: (a) categories reflected the purpose of the research; (b) categories were meant to be exhaustive (i.e., all relevant items can be placed into a category); (c) categories were mutually exclusive; (d) categories were independent; and (e) categories originated from a single classification basis (Merriam, 1988). Once initial categories were found, it was determined what things fit together--"which pieces of data converged on a single category" (Merriam, 1988, p. 134-135). We also sought to determine the data that did not fit the categories (i.e., divergence of the data).

Having determined the categories, data were compiled and transcripts were filed into categories. Examples of the categories were then placed in separate files for easier data handling and manipulation. We then gave an account of what happened at each site, analyzed the essential features of the data to determine interactions, and interpreted meanings and contexts of interactions to determine what it all meant (Wolcott, 1994).

Verification Steps

Qualitative research relies on verification procedures to ensure accuracy. These verification steps include establishing the trustworthiness and authenticity of data (i.e., validity and reliability). Concerns surrounding verification include triangulation of methods, feedback from informants, and determination of how participants will be involved in different phases of the research.

In order to verify validity in qualitative studies, researchers rely on credibility of findings and interpretations. According to Lincoln and Guba (1985), there are three ways to increase credibility: prolonged engagement, persistent observation, and triangulation. Prolonged engagement means that the researcher has spent sufficient time in the field in order to learn the culture, test for misinformation, and build trust. Persistent observation identifies the "characteristics and elements in the situation that are most relevant to the problem or issue being pursued" (p. 304). Triangulation means that data have been gathered from more than one source and in a variety of ways (i.e., observation, interview, and document analysis).

To increase credibility, we sought to increase the amount of time spent in the situation to determine the validity of information received from a participant by checking one perspective against others in the same context. Furthermore, during data collection, it was important to focus on mentor-mentee interactions rather than the entire scene. Lastly, by using a variety of sources for data, we were able to compare what was seen, heard, and read.

The Data

Interviews, observations, and experiences revealed numerous instances of learning and instruction interactions between apprentices and mentors. Analysis involved searching collected data for emerging topics and then organizing the data into relevant and definable topics and sub-topics (Merriam, 1988). Analysis began with two broad categories that reflected the primary focus of the study: learning and instruction and general perspectives toward the apprenticeship program. Under learning and instruction, the following categories emerged: tasks performed at work, interactions and teaching methods used by mentors, work-based learning, school-based learning, and work ethics and social behaviors. Three primary sources of data were used to develop a better understanding of general perceptions toward the apprenticeship program including participants' views, stated and experienced program benefits, and comparison of written documents with obtained data.

Learning and Instruction

Tasks Performed at Work

Youth apprentices performed a variety of job tasks usually assigned by mentors according to ongoing work demands. Although the level of task complexity varied considerably, they all appeared related to job requirements and relevant to work settings.

Computer electronics apprentices were responsible for a wide variety of job duties including the inspection and testing of circuit boards and computer parts for defects and installation and repair of computer equipment. At times, apprentices were required to telephone other businesses to obtain parts and check on prices and availability of parts, ship equipment for outside repair, or complete and maintain paperwork. Michael, the automotive maintenance apprentice, performed all duties of a diesel mechanic and was also required to occasionally work on gasoline engines. He replaced brakes and clutches, changed oil and filters, and completed the necessary forms and paper work associated with each repair. Some specific repairs included replacing a transmission, installing a rebuilt engine, replacing a glow plug module, repairing and replacing a water pump, and periodic service maintenance on vehicles (e.g., oil change, greasing all fittings, checking for leaks).

Overall, youth apprentices were assigned tasks appropriate for their assigned apprenticeship positions. However, some mentors afforded their apprentices opportunities to perform more tasks with greater variety and diversity. This may have been because of the nature of the work (computer and automotive repair), the mentor, or the career center curricula. For example, the tasks required of computer electronics and automotive mechanics apprentices seemed to naturally involve more variety and diversity.

Interactions and Teaching Methods of Mentors

Haensly and Parsons (1993) described a mentor as a teacher and role model. To fulfill these responsibilities, Hamilton (1989) listed a variety of mentor responsibilities such as instructing, demonstrating, coaching, explaining, challenging, initiating, and affirming apprentices in the completion of the tasks. In addition, cognitive apprenticeship models of learning highlight the need to provide apprentices with modeling, coaching, scaffolding, articulation, reflection, and exploration (Collins, et al., 1991).

Data indicated that mentors relied heavily on modeling, coaching, and scaffolding strategies to assist their apprentices in learning the processes and tasks associated with their work. The strategies tended to focused heavily on the dissemination of domain knowledge and heuristic strategies. Apprentices perceived this as their mentors' ability to show and tell them how to complete specific tasks. For example, Dale explained that his mentor " shows me how to do [things]... and if I get stuck ... he'll either give me a hint ... or he'll show me [again]." Sometimes Dale was encouraged to attempt or explore a task on his own before receiving help from his mentor.

Apprentices seemed to appreciate and benefit from mentors' explanations and demonstrations about "tricks of the trade" (heuristics); "things they don't show or tell you about in school." For example, at the automobile dealership, the apprentice was attempting to determine why a car battery would not hold a charge. The mentor, John, suggested that the search begin with the three wires connected to the solenoid. That would lead to a determination of what was causing a short in the electrical system. John proceeded to show the apprentice how the effect of each wire could be checked against the charge on the battery. The apprentice soon determined that the short was in a two-way radio connection. At the computer shop, the apprentice was unsure about where two wires connected on the circuit board. His mentor suggested that the path of wires be traced to determine where they were connected. That enabled a correct determination on where to connect the wires to the board.

On several occasions, mentors demonstrated tasks to apprentices by providing clues or hints (coaching and scaffolding) on how to successfully complete the tasks. As an example, Michael (apprentice) had to replace the water pump on a truck. However, two of the parts looked very similar and he was unsure about which part to connect first. At that point Michael asked his mentor for help. Rather than just telling Michael which part went on first, the mentor gave Michael a reflective strategy for distinguishing the parts. According to the mentor, the location of the screw holes was different for the two parts and could be used to determine which part went on first. Michael was asked if he understood and was instructed to demonstrate and talk through the differences. The apprentice then successfully explained that the one part went on first because of the number and location of the holes.

Other than this rather isolated example of articulation, there was little evidence to suggest that mentors relied on reflection, articulation, or exploration in the mentoring process. Even so, it appeared that interactions and teaching methods used by mentors were conducive to learning. Apprentices indicated that mentors allowed them to learn and explore aspects of their job independently, but would assist when needed. Furthermore, mentors provided apprentices with hints, clues, and heuristic strategies for completing an assigned task or procedure.

Work-based Learning

Hamilton and Hamilton (1992) suggested that work-based learning has relevance and is important to participants because of the need for successful performance. The immediate application and meaningfulness of knowledge encourages learners to seriously engage in the teaching-learning process. In addition, work-based learning in youth apprenticeship programs is a social activity based on a relationship between mentors and learners which contributes to students' educational and social development.

Apprentices expressed a belief that their work was relevant and appreciated that they could immediately apply new learning. However, the connection to real-world situations resulted in some unexpected experiences and job duties. For example, apprentices stated that they had job duties that were not part of their school-based training. The need to make phone calls to other businesses for information about the availability or cost of computer parts or return authorizations was one example of such tasks. Michael (automotive dealership) acknowledged that, unlike a textbook example of a problem, it was also a mechanic's responsibility to check and verify that problems existed as customers described.

In a classroom, you learn out of a book. In the book, it shows you ... how to do a brake job ... step-by-step... But what it don't do is ... show you what to do if the bolt's rung off or if the bolt's rusted up or if someone beat on it with a hammer ... Sometimes you run into stuff that someone's done [messed] up [and] it makes the repair a whole lot more difficult. And you [have to] learn through somebody else's experience.

In addition to unexpected duties, apprentices realized that they could use (transfer) school-based knowledge on the job. This was true at the computer repair center where the apprentice relied on trouble-shooting skills learned at the career center to provide early strategies for problem-solving. Michael, the mechanic apprentice, was able to describe how his school-based knowledge about brakes, transmissions, and rear axles helped him in his job. He also was able to apply knowledge learned in a class on communications to help with customer interaction.

School-based Learning

School-based learning has importance and relevance in preparing for the world of work. Apprentices in this study pointed out that school-based learning was quite different from work and work-based learning. While useful, participants did not feel that it adequately prepared them for work. While computer/electronics repair apprentices used their school-taught troubleshooting skills at work, school taught them nothing about how software affected installation and operation of computer hardware. The automotive apprentice was able to use his school-based learning to successfully work on a number of systems (e.g., brakes, clutch, electrical components). However, school taught him very little about working on diesel engines, his apprenticeship assignment.

Several significant differences between school-based and work-based learning were identified. The automotive repair apprentice, Michael, identified several

important differences.

Say if we was in class with 15 people ... [and] five or six other people in the class don't study, don't pay attention, see the class can't move on until everybody knows how to do it. So you're doing the same thing over and over and you lose interest in it ... When I come here [the automobile dealership], we're doing something different every day. Keeps you busy, you know. You don't get tired of your work. You can have fun with it... it's challenging ... Also, what I like about it [here] is... dealing with customers ... you don't in the classroom.

Another important difference is that of restraints on time experienced by school-based instructors. Several apprentices noted that unlike teachers who had limited amounts of time to spend with students, mentors were able to work longer and in greater detail to assist in learning. One apprentice summarized his experience stating, "A main difference [between work and school learning] is [that] I'm not sitting at a computer just studying about it. I'm actually doing it and working on it and ... apply[ing] it instead of just learn[ing] about it."

Work Ethic and Social Behavior

An important aspect of work is an ability to get along with co-workers, supervisors, and customers. Even though most apprentices displayed culturally appropriate work ethic and social behavior, when these types of problems arose in the workplace, they often had the most serious ramifications for apprentices. Problems in this area appeared to fall into two main issues--personal maturity and social behavior.

Several mentors and company executives expressed their apprehension about bringing 17- and 18-year olds into professional work environments. They openly questioned whether adolescents at this age possessed the maturity necessary to be productive and effective employees. One company manager explained his concern.

The biggest problem [is] maturity ... You look at 18 year-old kids coming in here [who] are still in high school working in this environment ... They come in, they didn't realize what it was like out there, but they learn and mature a lot quicker than they would if they didn't have this job or if they were working at [a fast food restaurant] or somewhere like that.

A computer repair mentor commented about the maturity of his apprentices.

That's where I had reservations about this program because it's bringing high school students into the work environment and I had concerns that [they] wouldn't be mature enough to be in a professional environment. In a grocery store or fast food place, that's what they expect because that's what they hire. But it's higher standards in a professional environment, I think.

During our observations, apprentices were terminated because they lacked appropriate work ethic. Specific behaviors thought to signify poor work ethic included excessive absences, being undependable, and leaving the work station to visit friends elsewhere in the plant. Interestingly, one apprentice was terminated because he began to keep company with a co-worker who operated on the principle that "slower was better." In addition to these problems, another aspect of concern for mentors was the level of interpersonal skills possessed by apprentices. The importance of good social skills was underscored often in our observations and discussions with workers. One mentor described it this way:

Even if your job is to work on the bench [repairing computer], you still have to interact with other employees. You have to learn the social skills to be able to work and get along ... In this type of situation, in a more professional setting, you have to learn how to get along and how to calm people down when their computer's not working.

While instances of apprentice immaturity or lack of appropriate social skills were not difficult to locate, suggestions from mentors about where or how to enhance the work ethic and maturity (often discussed as social skills or getting along with others) of their apprentices were difficult to solicit. One mentor matter-of-factly suggested that apprentices should enter the workplace with appropriate work ethic and social skills. Some apprentices in this study who lacked appropriate work ethics and culturally acceptable social skills were not given an opportunity to learn about or understand their importance while on the job. Instead of having a mentor or an adult worker take time to explain, role model, or discuss appropriate work ethics and social skills, students lacking these skills were fired.

One area of concern that emerged from these findings is the issue of responsibility for teaching appropriate social skills. Although some apprentices do learn about work ethics and social behaviors of work on the job, if apprentices lack these skills, as many did, who is responsible for seeing that they acquire them? Hamilton (1989) included work ethic as a dimension of learning that should be incorporated into the experiences and training of apprentices. However, if apprentices were being terminated because of poor work behaviors, who should take responsibility for teaching these young workers the necessary work ethic and social skills?

General Perceptions of the Apprenticeship Program

Three primary sources of data were used to develop a better understanding of general perceptions toward the apprenticeship program including participants' views, stated and experienced program benefits, and comparison of written documents with obtained data. Overall, most participants expressed generally positive comments about their involvement in the apprenticeship program. Senior executives felt that one strength of this particular program was that it allowed students to experience authentic work experiences related to vocational interests prior to graduating high school. This, in turn, allowed young people an opportunity to see the relevance of school-based knowledge and acquire an appreciation for the demands of modern work life.

Program mentors observed that this type of experience offered apprentices an opportunity to gain confidence in their work abilities. Several mentors explained it this way: "One of the things I hope we give Chris is confidence in her abilities and what she can do because that's something you don't always have when you get out of school." Mentors also expressed responsibility for helping their apprentices develop socially and personally. As one mentor explained, "there's a lot of things that schools don't teach, so I try to [instill in the apprentice] what's right or wrong. See, it's not always mechanic work--it's everything. [These are] life situations." Finally, one mentor believed that it was critical that apprentices be provided with a wide variety of experiences that would show how the *real world* operated as opposed to school-based learning with little immediate application.

Apprentices tended to focus on the view that involvement in this program provided them with an opportunity to receive on-the-job training, to gain valuable work experience, and to decide if they were truly interested in their occupational area. Apprentices also appreciated the chance to work one-on-one with adults who were competent in their field. Many commented on the ease at which they learned new information when working with their mentor. Finally, all apprentices sincerely believed that they were making a valued contribution to the successful completion of assigned work duties. In some respects, this last issue was considered very important to the apprentices, i.e., being a valued and contributing member of a social (work) group with clear and measurable goals; something missing in many school classrooms.

One goal of this youth apprenticeship program was to assist young people in gaining work experience, making solid connections between school-based and work-based learning, and providing a structure for obtaining a 2-year associate's degree from the local technical institute, if desired. Many, although not all, apprentices in this study were planning to attend some type of 2-year or 4-year postsecondary institution. Dale, the apprentice at the school district computer repair office, planned to go directly to a 4-year university. Michael's decision to not pursue formal schooling rested heavily on travel requirements and the high costs of tuition, books, and automotive tools required by the local technical institute. Interestingly, this last requirement was a barrier to schooling but not a barrier to work. Although Michael had the essential tools needed for work, he did not have *all* the tools required by the technical school. As a result, he chose to enroll in a company-sponsored training program for his specific work duties. By making this choice, he was not required to have to purchase additional tools or to pay expensive tuition.

Discussion

This case study was conducted to explore, interpret, and describe experiences and interactions that occurred between mentors and apprentices enrolled in a secondary-based youth apprenticeship program, not to evaluate the program. The intent was to describe the teaching and learning methods and behaviors of mentors and youth apprentices. Although data collection was limited to a few select sites and participants, several implications emerged that may have relevance for the learning in the workplace component of youth apprenticeship programs.

Youth apprenticeship programs may reduce discrepancies between school-based and work-based learning. In this study, youth apprentices discussed how being in a

workplace allowed them to apply what they had learned at school to real-world situations. These apprentices were provided with opportunities to participate in socially shared, hands-on activities completed cooperatively with adults in achieving identified goals.

Hamilton (1989) indicated that mentors should instruct, demonstrate, coach, explain how or why tasks are completed, initiate apprentices into the culture of the workplace, and affirm a learner's value as an employee and as a person. All of these behaviors were observed in the mentors studied. We found evidence of mentors using instruction, demonstration, coaching, and explanation to apprentices of how and why tasks or procedures were completed in certain ways. In addition, mentors appeared to make thoughtful attempts at enhancing the self-esteem of their apprentices by allowing independent work and then praising a job well done. What makes this finding most interesting is that these mentors received no formal training from this program. We had gone into this study with a preconceived notion that mentors without formal types of instruction in pedagogy might be less adequate than those with training.

Limited research exists about how mentors (like the ones in this study) gain the skills needed to successfully instruct apprentices. None of the mentors had received any formal training. A mentor has many responsibilities, not the least of which is to teach. Additional research is needed to determine how mentors provide effective instruction on the job and to determine if mentors need formal training to be effective. Our findings suggest that mentors chose instructional strategies that felt natural to them. But what would happen if the apprentice fails because of the mentor's lack of ability to teach? Who's fault is it then--the mentor or apprentice? Research is also needed to determine the amount and type of training mentors may need to be effective teachers and role models. Although public school teachers are required to have a college education, mentors are not. Does this make a difference or do experienced, expert adult workers innately use methods they believe are more beneficial?

Hamilton and Hamilton (1992) reported that some workplaces are more conducive to learning than others. In this study, apprentices in computer/electronics repair and automotive mechanics worked closely with their mentors, were assigned a variety of tasks to perform, and were allowed to work independently when competence was attained. However, during site selection, we discovered that some sites offered little in the way of educational experiences. As previously noted, some site representatives assigned apprentices to boring, routine tasks with little attention to technical or social skill acquisition.

Another major issue of the youth apprenticeship program we observed was related to work ethic and social behavior. Being in the company of adult workers allows apprentices to observe adult behaviors and actions that can assist apprentices in their overall development toward adulthood and the transition from adolescence to adulthood (Hamilton & Hamilton, 1992 ; Lave & Wenger, 1991). Yet, while apprenticeships can be a useful vehicle for instruction on work ethic and social behavior, we found little tolerance for unacceptable or inappropriate work-related behaviors. As such, several questions emerged such as "If apprentices do not have a sense of work ethic or a clear understanding of appropriate social behavior at work, how is (or should) these behaviors be taught? Who is responsible?" and "Should an appropriate work ethic be a prerequisite for inclusion in youth apprenticeship programs?"

This study was completed because of an interest in how learning occurs in the workplace and to document preliminary information about the nature of how learning and teaching occurs in mentor-apprentice relationships. Although interesting findings emerged, several areas for additional research appear warranted. Future studies may explore the social aspects associated with learning in a workplace. Although some data were obtained on this topic, more is needed to get a more complete picture of how students are introduced to and accepted (assuming they are accepted) into a workplace environment. This may be especially significant considering several people in this study suggested that youth apprentices are just that, youth apprentices and not *regular* employees. Considering that these students work alongside experienced employees for the purpose of gaining knowledge and skills associated with their chosen career, what is the difference between being a high school student enrolled in a youth apprenticeship program and a high school student hired to work part time at a business? Maybe a more appropriate question would be, what are the defining elements of a youth apprenticeship program and what makes it unique?

Finally, additional study on the training and role of mentors appears to be warranted. Would more training result in a better mentor or is it more a matter of selecting a competent, dependable, and willing employee? According to our findings, mentors exhibited effective teaching behaviors even though they had no formal training. If untrained mentors are able and willing to work with students who are truly interested in learning, what makes a youth apprenticeship program different from paid part-time work experiences?

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Appendix

Interview questions for mentors and apprentices

Apprentices

1. What benefits do you think you have received from having mentor?
2. How would you define "mentor"?
3. What are some things your mentor has taught you?
4. What do you think your mentor expects from you?
5. What do you think your mentor gets from the relationship?
6. How has having a mentor affected your learning?
7. Is there a difference between learning at work and learning in the classroom?
8. Do you use information learned at school on the job? Do you use information learned on the job at school?
9. Overall, what do you think about the youth apprenticeship program?

Mentors

1. What does it mean to be a mentor?
2. What do you expect from your apprentice?
3. How have you taught your apprentice?
4. How much time do you think you spend training your apprentice?
5. What have you taught your apprentice?
6. What goals do you have for your apprentice?
7. What have you learned from your apprentice?
8. Did you go through any kind of training to be a mentor?



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Apprenticeships - Case Studies. Danielle Patrick, Broadcast communications apprentice. Where did you see the apprenticeship advertised? On the government website, National Apprenticeship Service. What made you apply for the apprenticeship? I have a keen interest in theatre and media so applying for this apprenticeship was a no brainer! Describe a 'typical day' as an apprentice at the Royal Opera House. It is hard to describe a typical day, as every day is completely different from the next! I have already learnt so many important life lessons and skills to help me in the future. My confidence has grown massively and it is all thanks to my incredible work colleagues. What are your ambitions for the future? Skill acquisition depends on levels of keenness, confidence, competitiveness, self-esteem and relations with others and even level of aggression. These personality traits are enhanced as involvement in activity is continued. Roger Federer is a good example of someone who exhibits all these personality traits (see article opposite). As noted earlier, in the early stages of learning a skill or activity, the coach tries to make the learning environment as stable and predictable as possible. Skills performed in this sort of environment are said to be closed skills, whereas skills performed in a changing, unpredictable environment are open skills. The work-based learning component of the Youth Apprenticeship Program is the primary method for teaching the required competencies. The local business becomes an extension of the classroom for the youth apprentice. Workplace mentors are one of the most critical elements which often determine the success of a youth apprenticeship. One mentor may work with more than one youth apprentice at a worksite, and the mentor may assign multiple "trainers" to instruct the youth apprentice while they rotate among various departments. Effective Mentor Qualifications. Good communication skills in the workplace. Knowledge of and commitment to the Marketing Youth Apprenticeship program. Mentor Responsibilities.