

American Journal of Educational Studies (AJES)

Volume 2, Number 1, 2009

ISSN 1934-6476

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Page contact: Dr. Aaron Clark ● P.O. Box 3552, Cary, NC 27519-3552 ● (919) 434-8160 ●
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**A WORK OF A.R.T.
ACCOUNTABILITY, RESPONSIBILITY, AND TEAMWORK
A CROSS-CULTURAL MODEL FOR INDIVIDUALIZING INSTRUCTION**

**Maryanne Maisano
Western Carolina University
Cullowhee, NC 28723**

ABSTRACT

This paper presents a cross-cultural model for individualizing instruction as an educational model in which curriculum and instruction are tailored to the needs of learners to ensure success. The studies and research of Piaget, Vygotsky, Montessori, Dewey, Gardner, among other educational giants have addressed the key factors that contribute to a successful school learning for all children regardless of cultural background and socio-economic situations. Three of these factors are: (a) multiage education, whereby children are grouped according to their educational needs rather than their physical age (b) knowledge-based instruction, which is rich in content, and which does not necessarily follow a strict curriculum, and (c) intensive focus on integrated language instruction that unites reading, writing, and speaking in an engaging format appropriate for each child's specific needs and learning strengths. In addition, there must be **Accountability** of administration and faculty to provide outstanding education; **Responsibility** on the part of students to learn to their highest potential, and **Teamwork** of parents, faculty, and children. The research and the results that accrued in a specific kindergarten to eighth grade school based on the work of educators from diverse cultures and the melding of **Accountability**, **Responsibility**, and **Teamwork** is the focus of this paper.

Introduction

This paper presents a model for individualizing instruction so that all students within a specific educational setting experience continuous success. We define individualizing instruction as an ongoing systemic process in which the students:

- are in multiage classrooms
- have a profile of their abilities and skills
- are engaged in knowledge-based instruction and active learning activities
- learn to write systematically and developmentally and integrating writing into all areas of the curriculum

To implement and maintain this model of individualizing instruction, the educational setting is committed to

- an administration and faculty *accountable* to the essential goal of providing high-quality instruction
- students developing *responsibility* for working to their highest potential
- consistent *teamwork* among parents, the school, and the students.

History of Individualizing Instruction

The first individualizing instruction plans were developed between 1910 and 1920, but were not popular and failed probably because the task fell mostly to teachers who could not manage plans for 20 to 30 students by themselves. In the 1920s, however, several plans were developed that were quite successful. They involved self-directed as well as teacher-led instruction and provided support for the continued development of well-designed materials and instruction (Gagne et al., 1992).

Ward and Burk (as cited in Gagne et al., 1992) created a set of self-instructional materials that allowed learners to progress at their own pace with a minimum of teacher direction, but they were stopped by a California court ruling that stated that only the State Board of Education could publish printed instructional materials. Washington and Parkhurst, associates of Burk, in the Winnetka, Illinois, public schools, the Winnetka Plan (Gagne et al., 1992). The Winnetka Plan included self-paced, self-instructional, self-corrective workbooks; diagnostic placement tests in which learners were tested to determine which goals and tasks they should tackle. The plan also included tests that students could take themselves to determine if they were ready for testing by the teacher and had a simple record-keeping system which tracked the progress of each student. Only after performing satisfactorily on the teacher-administered test could a student go on to new material (Gagne et al., 1992).

The two main tasks for faculty were therefore to analyze and organize course content into specific objectives and to develop a plan of instruction that would allow each learner to master the objectives at his/her own rate. Group activities were not overlooked; approximately half of each morning and afternoon was devoted to activities such as music, plays, student government, and open forums for discussion. Under the Winnetka plan, classrooms became laboratories or conference rooms, and teachers became consultants or guides (Gagne et al., 1992, p. 24).

Gagne also cites the Dalton Plan, a model of individualizing instruction, originally developed by Helen Parkhurst to use in an ungraded school for handicapped children. The Dalton Plan included contract learning where having agreed to a contract, students were free to work at their own pace, with no new contracts permitted until the current one was satisfactorily completed. Parkhurst, after experimentation in her own one-room school with Maria

Montessori, developed what she termed the Laboratory Plan, which called for teachers and students to work together toward individualizing goals (Gagne et al., 1992). The Laboratory Plan was put into effect as an experiment in the high school of Dalton, Massachusetts, in 1916. From this beginning, the Laboratory Plan and the Dalton School eventually took their name and their mission (Gagne et al., 1992).

Following these early beginnings, many studies have been done on the value and usefulness of individualizing education programs, a famous one being the work by Snyder (1975). This study showed that a failure to provide for individual differences among students is perhaps the greatest single source of inefficiency in education. Snyder presciently argued that with the advent of new communication technology in the 1960s, the long-desired goal of individualizing instruction, which provides for the differences among students, was capable of being reached. Within a few years individualizing instruction became more widespread (Snyder, 1975). In 1972 a study by the Air Force Human Resource Laboratory of 38 existing individualizing instruction programs reduced the training time of the recruits and also found a significant improvement in graduate performance. Snyder concluded this data provided an impetus to change to individualizing instruction and do further research (Snyder, 1975).

Snyder noted that a typical class consists of a group of students, individually different in their abilities and interests, who sit listening to an instructor lecturing about a subject, with the students taking whatever notes they desire. If the instructors use the chalkboard or other teaching aids, they use them rather sparingly, and when they direct attention to a displayed item, their hand stays there only a short time, so that the students rely mostly on their sense of hearing to take in new information (Snyder, 1975). When students realize that they missed a key point, they ask for a repeat explanation, meaning that the whole class stops its progress while one student gets his/her needed facts. The routine is interrupted infrequently with a test to measure student progress formally; little effort is made to re-teach identified weak areas, as there is no time for that in a conventional classroom. The result of this style of teaching is that only a few students get high grades and the majority of students have gaps in their understanding of the subject with less retention and often high failure (Snyder, 1975).

Snyder's (1975) analysis, one of the first analyses of individualizing instruction, emphasizes the factors that are important in securing success in individualizing instruction programs and compares these factors with more traditional, teaching methods that include (a) little attention to differences in student abilities, (b) spare use of training aids, (c) great reliance on one sense of hearing, (d) need for repeated explanations, (e) slow pacing to meet needs of certain students, (f) insufficient testing, (g) little re-teaching, and (h) disappointing results (Snyder, 1975).

Background of This Study

Recognizing that each child is unique is the impetus for individualizing instruction (Gagne, Ward, Burk, Washington, & Parkhurst, 1992). Students have diverse learning styles, learn at different

rates, come from varying socioeconomic backgrounds, and have variations in their intellectual strengths (Gardner, 1993; Gardner & Hatch, 1989). Individualizing instruction is both necessary and effective in working with at-risk students and has been shown to offer the same benefits of learning to all other students. (Hamby, 1989; NDPC/N, 2004).

Although special education requires individualizing education plans, standard-based education programs refer to the *group*, not to the individual student (Stainback & Stainback, 1992). Statistics on dropout rates show that numerous non-classified students do not succeed because they are not treated as individual learners (NDPC/N, 2004). By not recognizing unique learning needs, many students do not get the opportunities they need for reaching their potential. When students perceive that they do not seem to learn like everyone else, they often see themselves as failures and are similarly judged by their teachers. (Levine, 2002; NDPC/N, 2004; Pugach & Warger, 1996).

Concern about student dropout and failure has prompted the National Dropout Prevention Council examine the tenets of individualizing instruction study how can it improve student education (NDPC/N, 2004). One way to understand this concept is to look at how it is used in special education. The Individualizing Education Plan (IEP) provides the foundation for learning; it is developed as a collaborative effort of students (when appropriate), teachers, parents, school administrators, and related service personnel. Many schools utilize IEPs with students who score below grade level on standardized tests, but are not necessarily classified (Schargel & Smink, 2001). Unfortunately, most regular classroom teachers are not required to provide an IEP for non-classified students nor even to consider its provisions. (NDPC/N, 2004).

The most effective way to learn new material is to connect the new content to prior knowledge, requiring the teacher to know each student's knowledge level through pretesting, questioning, and observation. (Heynen, 1998). The educational philosophy of constructivism has as its basis the ability of learners to construct new knowledge and give meaning to new learning which requires activation of prior knowledge combined with experiential learning. (Caine & Caine, 1991).

Instructional strategies that stimulate knowledge building include: problem-based learning and reciprocal teaching, peer tutoring, cooperative learning, hands-on learning, journaling; questions, cues, and advanced organizers, role playing, summarizing and note takings, nonlinguistic representation and reinforcement and recognition (Marzano, Pickering, & Pollock, 2001; Switzer, 2004). While all or some of these strategies are used in classrooms, they are often used in isolation and rarely combined as the full course of study or instruction at the (NDPC/N, 2004).

Another impediment to quality instruction has been the use of intelligence as an immutable measure for learning and school achievement (Ezarik, 2001; Gardner, 1993). Ezarik proposes that educators must think not how *intelligent* a student is, by how a student uses her/his intelligence. The following example is given: A child spent her elementary school years drawing

in the margins of her assignments. Her teacher noticed that she had difficulty recalling class lessons, and although the doodles were in the form of beautiful pictures, the teacher saw the child as unmotivated and lacking pride in her schoolwork. One day the teacher was giving a science lesson on the earth's structure, and the child excitedly shared a drawing she had done during the lesson which was her interpretation, understood solely by her, that were images of the earth's core, mantle, and crust, with appropriate features and proportions displayed through her artistry. Learning came to life for this child when she could draw, chart, or symbolize information with images, as if her doodles were her notes. Through this non-linguistic representation the child had of used her artistic abilities to learn, which was how she learned best (Marzano et al., 2001).

Schools typically reward students for verbal and math skills; these abilities are the focus of standardized tests such as the SAT and ACTs as well as IQ (intelligence quotient) tests (Ezarik, 2001). Dr. Howard Gardner, a Harvard University psychologist, however, has a different point of view on intelligence (Gardner, 1983, 1999). He recognizes a range of intelligences, or multiple intelligences, pointing out that we all have different amounts of each type of intelligence, providing each person with an array of strengths and weaknesses. Gardner's concept of intelligences (e.g. linguistic, artistic, musical, mathematical, interpersonal, intrapersonal, visual-spatial, bodily-kinesthetic, naturalist) provide the impetus for an individual focus in contrast to a group focus.

Two of Gardner's intelligences--interpersonal and intrapersonal--have been studied closely by Daniel Goleman, (1995) (Ezarik, 2001) and indicate that students with emotional ties to their learning are more engaged and are likely to have positive outlooks and responses, a premise further elaborated upon by Jensen (1998).

Both teachers and parents can play an effective role in enhancing various intelligences. By being alert to the vast array of intelligences in a group, students can sample many activities that tap into intelligence. To remember ideas, for example, students can use rhymes or lyrics, or think of song titles that remind them of what is being taught, or make up rhymes to help remember procedures (Ezarik, 2001). For mathematics, teachers could have students explore the mathematics of music through beats and pauses and then relating the activity to fractions, thereby combining nonlinguistic representations with musical and mathematical intelligence (Marzano et al., 2001). For history, a class can study the culture of a particular time period by researching the musical instruments and style of music that was popular during that era (Ezarik, 2001). Essentially, individualizing instruction means matching the subject to the strengths of the student.

A Specific Case Study of Individualizing Instruction: The South Florida Academy of Learning (SFAL)

The South Florida Academy of Learning (SFAL), a kindergarten through eighth grade independent school from 1996- to 2006- was based on the concepts and research that support

individualizing instruction within the framework of Accountability, Responsibility, and Teamwork. The critical components of the program at SFAL were innovative small group instruction in a multiage environment that provides knowledge-based instruction, develops communication and technological capabilities, and builds cultural literacy. Students learn through individualizing instruction and systematic developmental writing strategies integrated through all aspects of the curriculum so that they can be creative, imaginative, and innovative thinkers, actively involved in academic and social activities that build self-confidence, self-esteem, and self-motivation.

The components of this model as implemented in SFAL are outlined here.

Components for Individualizing Instruction

Multiage Classrooms

In a multiage classroom, students of different ages and ability levels are taught together without division into grade designation, within an age range of commonly three years (Hoffman, 2002). Curriculum and teaching practices allow students to approach tasks according to their developmental, rather than age, levels. Some grade-specific teaching may occur because of state-mandated curricula and testing, but cross-grade teaching is the norm. In this kind of educational setting, frequent instructional opportunities for peer learning are planned. Much of the philosophy that defines multiage settings and instructional techniques comes from a cognitive-developmental perspective. Whenever multiage classroom teachers design lesson plans and strategies for learning new information or enriching and developing important core knowledge, they need to think of how students will work in small groups to achieve the learning outcomes (Hoffman, 2002).

Collaborative Small Groups

The students often work in collaborative small groups that are teacher or student led. Throughout a school day, students in a multiage setting work in a variety of flexible grouping arrangements based on the needs and interests of the students around an instructional context (e.g. Democracy in America), rather than on a prescribed textbook curriculum (Hoffman, 2002). In providing instructional contexts for their students, teachers in multiage classrooms make decisions influenced by peer learning theories (Hoffman, 2002) and are knowledgeable about instructional contexts that promote collaboration among their students (Chase & Doan, 1994; Hoffman, 2002; Marshak, 1994).

Students form small groups on their own as they work through instructional activities, usually in the context of learning centers. The size of the groups is usually limited by the work space and the overall physical environment. The typical multiage classroom has tables used flexibly as workspaces; there is seldom room for more than five students to be working at an area at one time. Students are encouraged to work together and offer and ask for help from one another

(Hoffman, 2002). The teacher monitors students making sure that interactions are positive in nature, with different students taking on a leadership role (Hoffman, 2002).

High-Quality Social and Interactive Behavior

Palincsar and Herrenkohl (1999) have identified four key social behaviors necessary for student collaboration:

- 1) Contribution to the group's efforts by contributing ideas, sharing resources, and taking turns with different tasks
- 2) Giving reasons for ideas and providing examples
- 3) Respecting the ideas of others
- 4) Building on each other's ideas

A variety of theoretical perspectives on peer learning can be drawn on to explain the potential power of the group learning context described above. Social-motivational perspectives can be drawn on to explain why common interest groups are successful (Hoffman, 2002). Student choice is a key factor in supporting autonomous learning, and the opportunity to exercise choice is rewarding in and of itself: Piagetian theory (De Lisi & Golbeck, 1999) suggest that learning and conceptual development are more likely to occur in contexts where there is mutuality of power and influence, as is the case when students choose groups based on common interest.

Stimulating Curiosity

Hoffman (2002) gives an example of how multiage-students working at a higher ability level are challenged when they are able to remain stimulated and curious about the task at hand. In a primary multiage classroom studying a unit about weather forecasting, three students were given the challenge of going to the computer center to search the Internet for information about barometers and then to report back to the class with the information. Hoffman points out that from this seemingly simple task, students learn to accept differences in abilities and social behaviors by working side by side with classmates whose rates of development vary cognitively and socially. This heterogeneous grouping fostered an appreciation of their various strengths. A student who may have much background knowledge to add to a problem-solving situation is respected for that knowledge, while another student working within that same group may have more developed social skills and can model fairness and sharing for classmates (Chase & Doan, 1994).

High-Level Through Intellectual Diversity

Vygotskian theory (Hogan & Tudge, 1999; Vygotsky, 1978) can be drawn on to explain how differences in ability translate into learning. When one student helps another accomplish a task he or she could not do without assistance (as is often the case in the multiage classroom), the

more able student is operating within the other student's frame of reference or understanding (Hoffman, 2002). Both Vygotsky (1978) and Piaget (1954) address the issue of students with different abilities working as a powerful factor for high-level learning. Students expect and accept differences, and such differences do not make students unequal. Thus, within a multiage classroom, students do not see themselves as highly differentiated, but rather as team members in the learning process. (Hoffman, 2002).

Various other theoretical perspectives on peer learning suggest the deliberate grouping of students with different abilities. The cognitive/elaborative perspective states that students who rehearse their strength (e.g., addition skills) are given an opportunity to more deeply process their own understanding (O'Donnell, 1999). From a Vygotskian perspective there is the possibility that the more able students can model a skill and perhaps provide a scaffold for the less able student (Hoffman, 2002; Vygotsky, 1978).

Ongoing Teaching of Writing As a Curriculum Unifier

Every student has the opportunity to participate in innovative small group instruction in a multiage environment that provides knowledge-based instruction, develops communication and technological capabilities, and builds cultural literacy. To achieve these goals, all the students are provided with systematic developmental writing strategies integrated through all aspects of the curriculum so that they can be creative, imaginative, and innovative thinkers, actively involved in academic and social activities that build self-confidence, self-esteem, and self-motivation. In Rothstein, Rothstein, and Lauber in *Writing As Learning* (2006) define writing as a "curriculum unifier" that "draws together multiple subjects and helps students understand the unity or interrelatedness of subject matter" (p. 3). When students are "taught to write systematically from kindergarten through 12th grade...creating their own personal thesauruses, writing biographies and autobiographies, expressing a wealth of knowledge, creating fables, myths, and folk tales, and express their ideas and opinions in personal, persuasive, and explanatory essays...they learn deeply, meaningfully, intelligently, and actively" (p.3). With a collection of writing and writing portfolios, the goal of individualizing instruction begins to be fulfilled.

Continuous Monitoring of Individual and Group Progress

During the time that students are working together, the teacher monitors the progress of each group, asking relevant questions and guiding progress. The teacher should also be monitoring the partners for successful cooperation and interactions and be cognizant of the needed interventions. For example, Woolfolk-Hoy and Tschannen-Moran (1999) describe some of the possible problems that may occur within the groups when students are not fully participating. One is the "free-rider effect" when one of the students is not doing his or her fair share of work or when the student is relying on the more motivated or more capable partner. . Another possible scenario is "cognitive loafing" which happens when students fail to challenge one another and the thinking levels decline. A third problem may occur when two students fail to

correct misconceptions and therefore reinforce misunderstandings or faulty ideas (Hoffman, 2002).

The hallmark of collaboration is when thinking is distributed among members of the group and where the group shares cognitive responsibility for the tasks (Palincsar & Herrenkohl, 1999). As students engage in dialogue with others at different developmental stages and attempt to explain and justify their point of view, they will begin to move toward a higher level of development. In the process of resolving cognitive conflict, group members can develop new concepts and structures of knowledge (Hoffman, 2002).

Individualizing Instruction at South Florida Academy of Learning

The South Florida Academy of Learning, a kindergarten through 8th grade school, was founded on the principles of individualizing instruction as discussed in this paper. Its philosophical premise was that excellence in education requires shared vision and a commitment for all stakeholders-- students, parents, teachers, and administrators to insure quality education. Participation among stakeholders was essential to the success of the program, through accountability, responsibility, and teamwork with a commitment to provide outstanding education to all the students. Because monitoring effectiveness of the school's goals was essential to all the stakeholders, three instruments were used to determine the fulfillment of high-level learning for all the students based on the principles of individualizing instruction. These instruments included:

- On going structured observations of how the community of stakeholders functioned to assure student success.
- Longitudinal analyses of the norm-referenced grades of children attending the school for a consecutive period of four year.
- Surveys and feedback from parents taken regularly and analyzed for determining student success.

Results and Recommendations

The following qualitative and quantitative information about SFAL and the effectiveness of individualizing instruction emerged through the use of these instruments.

- Progress based on norm-referenced test scores – All the students assessed for the purpose of this study entered SFAL with below grade level scores and after a four-year period were on or above grade level in reading and mathematics.
- Writing in curriculum areas—Using Florida state standards for writing based on holistic scoring, students assessed increasingly moved higher over the four-year period of assessment.

- Knowledge-based instruction – With emphasis on knowledge related to social studies and science, all students in this study developed portfolio products that evidenced deepening knowledge of subject matter drawn from trade books, research material, and Internet sources.
- Stakeholder satisfaction – Parents, students, and faculty, through questionnaires and school meetings voiced increasing satisfaction with the concepts of individualizing instruction through the four-year period of this study.
- The school program was successful for student with a wide range of abilities and skills.
- Students developed conscientious work and study habits and had opportunities to celebrate their success.

Summary of the Effects of Individualizing Instruction

The goal of individualizing instruction is to have students become creative, imaginative, and innovative thinkers, actively involved in academic and social activities that build self-confidence, self-esteem, and self-motivation. The factors that contribute to a its success school program are (a) multiage education, where students are grouped according to their needs rather than age (b) provided with knowledge-based instruction, rich in content, and which does not necessarily follow a strict curriculum but is flexible to ensure learning and (c) an ongoing instruction writing program emphasizes strategies for writing across the curriculum. The combination of these three facets of individualizing instruction at SFAL created a successful educational institution, with students achieving higher grades and parents satisfied with their children’s education.

At SFAL, there was a consensus of the vision of the school from all its stakeholders-- students, parents, teachers, and administrators — who became committed to accountability, responsibility, and teamwork.

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ARE THERE GENDER DIFFERENCES IN FACTORS INFLUENCING CAREER CONSIDERATIONS?

Cathy Hall, Stephanie Sullivan, Paul Kauffman, David Batts, and Jeremy Long

East Carolina University

Greenville, NC 27858

ABSTRACT

While some gains have been made in attracting female students to the STEM (science, technology, engineering and math) fields over the past decade, the number of female students who have chosen to pursue these fields in higher education is still limited. This study reviews factors that influence rural high school students to consider career options in the fields of science, technology, engineering and math (STEM). It examines 117 high school students (55 male and 62 female adolescents) involved in a summer Information Technology Experiences for Students and Teachers (ITEST) program funded by the National Science Foundation. The students in attendance were nominated by their respective high school as demonstrating potential skills in the STEM areas; but, because of gender, minority status and/or financial issues might not choose to pursue these careers options as young adults. During the course of the program, students were asked to provide information on factors such as peer influences, family, school, and media that they felt were influential in their consideration of viable careers. Students were also asked about their likelihood of taking higher level math and science courses in high school beyond the normal requirements. Comparisons in student responses were made with respect to the students' gender. While many areas assessed were consistent across gender, some notable differences were also observed. Better understanding of why these discrepancies exist is critical to help guide interventions to improve STEM access for women and in particular rural areas needing economic development.

This study was supported in part by National Science Foundation grant NSF 05-621.

Introduction

While overall gains have been made in increasing the number of women pursuing careers in the STEM fields, a significant discrepancy still exists between men and women choosing to pursue a degree and subsequent employment in these fields (National Science Foundation, 2004). For example, according to the National Science Board's (2008) Science & Engineering Indicators Report, women received only 20% of bachelor's degrees awarded in engineering and 22% of those in computer sciences in 2005. Women now make up over half of the students entering colleges, but the number of women choosing to major in various STEM fields is still very low overall (National Science Foundation, 2005). In addition, women who enter college declaring they plan to major in the STEM fields hold a higher attrition rate in comparison to their male counterparts (Bureau of Labor Statistics, 2006; Committee on Equal Opportunities in Science

and Engineering, 2000; Cuny & Aspray, 2000). When employment figures are assessed, the number of women entering the workforce in these areas is even lower (National Science Board, 2003). National concerns have been raised about the potential shortage of well-trained professionals in the areas of math and science in the United States (Bureau of Labor Statistics, 2006; National Science Board, 2004).

Research has indicated a wide array of factors may influence students' interest in career options as well as in pursuing a higher education degree (Harris & Halpin, 2002; Kekelis, Wepsic, & Heber, 2005). These factors include parents and family (Eccles, 1997; Epstein, 1992; Haverman & Wolfe, 1995; Windham, 1996), teachers and counselors (Howe, 1997; Lumsden, 1997; Terenzini et al., 1994), friends and peer groups (Davies, Spencer, & Steele, 2005) as well as the popular media (Walton & Cohen, 2007). A sense of belonging and seeing a good fit between a discipline and oneself can make a difference in students' career choices. Walton and Cohen (2007) have researched how belonging uncertainty undermines motivation and achievement among college students. Factors such as having friends in the same discipline and establishing a mentoring relationship with a teacher in a particular discipline can foster a sense of social belonging which in turn impacts achievement. Kekelis et al. (2005) also note the importance of career guidance and support in order to encourage young females to participate in programs that expose them to technology. They recommend hands on exposure to technology – and as early as possible, challenging girls' stereotypes of technology fields, and providing better opportunities and information for girls to explore technology careers with their parents support.

The NSF ITEST grant proposal on which this study is based was developed in part to help encourage students from rural areas in a southeastern state to pursue higher level math and science courses through hands-on learning activities in their high school curriculum. In addition to providing training and resources to local area teachers, a student summer academy was also developed. High school students were brought to the university campus for a three week summer academy with a focus on hands-on experience with robotics, solid modeling, biomechanics, Excel, and leadership. The academy targeted underrepresented students including minority and female students who demonstrated ability based on teacher recommendations and prior course performance to do well in STEM fields but who might not have considered these fields as career options.

Given the issues of attracting and retaining women in the STEM fields, this paper focuses on looking at factors that might influence female high school students to consider various STEM career options in comparison to their male counterparts during the academy. Three specific questions relative to gender were asked. Were there gender differences in factors students reported as being influential in their consideration of career options? Did the academy influence female students to consider taking more advanced science and math courses at the high school level? Did participation in the summer academy serve to increase the interest of female students in pursuing careers in science, engineering, and information technology?

Method

Participants

One hundred-and-twenty-one high school students with a mean age of 14.8 (range 12-18 years of age) participated in the current study. Sixty-four 62 (53%) were female students and 57 (47%) were male students. The race/ethnicity of the students was as follows: American Indian 3 (2 male, 1 female), African American 49 (19 male, 30 female), Pacific Islander 1 (0 male, 1 female), Asian 3 (2 male, 1 female), Hispanic/Latino 17 (8 male, 9 female), Caucasian 46 (26 male, 20 female) and other 2 (0 male, 2 female). Nineteen (15.7%) were rising 9th graders, 60 (49.6%) were rising 10th graders, 31 (25.6%) were rising 11th graders, and 10 (8.3%) were rising seniors (one student did not indicate grade). Four students (2 male and 2 female) failed to complete both pre- and post surveys and their data sets were eliminated from the analyses leaving 117.

The students were attending a summer academy funded through an NSF grant in order to help promote interest in STEM careers. Students were chosen from six rural school systems in eastern North Carolina. A primary focus of the academy was to attract female and minority students from lower socioeconomic status (SES) backgrounds who exhibited talent in math and/or science, but who might not know about or have opportunities to explore career options in the STEM areas. SES status was estimated for purposes of the grant on students' eligibility for reduced or free lunch programs at their respective schools. While there are limitations to using free or reduced lunch to assess SES, it did provide a marker that could be utilized without intrusion into families' personal finances. It should also be noted that many families may actually qualify for free or reduced lunches but may choose not to apply and would not be identified by this method. Taken these limitations into account, 76% of the students attending the academy were on free or reduced lunch programs with a range of 56% to 100% of participants on free or reduced lunches for the participating school systems.

Instruments

Three specific questionnaires developed as part of the grant were used to ascertain if there were differences between female and male students in factors that influenced consideration of course and career options. The questionnaires focused on: 1) specific influences on career choices; 2) the likelihood of students taking advanced courses in math and science as a high school student; and 3) the student's interest in career options related to the STEM fields.

Procedure

As part of the academy, students were asked to complete a questionnaire based upon factors they felt influenced their likelihood of considering various career options. These included factors such as friends, peers, parents, teachers, counselors, the media, degree options, earning potential and affordability of college program. This questionnaire was administered toward the end of the second week of the academy (see Appendix). Students were also asked to indicate which courses in math and science they planned to take in high school both before and after

completing the academy. Finally, students were asked to indicate their interest in career options related to the STEM fields prior to and after participating in the three-week academy.

Results and Discussion

Part A of the first questionnaire asked students to rate 10 factors that might influence their willingness to consider a specific career choice on a scale of one to five with one being no influence and five being a very strong influence. When ANOVAs were computed on each of the factors to determine if gender differences existed in responses, only one significant factor emerged based on gender and was the influence of a teacher. Female students rated this significantly higher in influencing their consideration of a potential career than their male counterparts. There were no significant differences between male and female students' ratings of the influence of any of the other nine factors. Means, standard deviations and p values are presented in Table 1. In looking at the overall ratings, both male and female students rated fitting with their own interests, earning potential of a field, and their parents as being important in influencing their thinking about future career choices. The top three rankings in order of priority also indicated some interesting insights. Both female and male adolescents rated interest in an area, parents, and earning potential as first, second and third in regard to influence.

Part B of the first questionnaire asked students to rate five additional areas in terms of importance in their interests. ANOVAs were run on each of these items to determine if gender differences existed, and two of these factors emerged as significant for gender. Having a teacher who encouraged them and having someone at their school that was knowledgeable about different careers were significant for gender. Female students rated these two factors at a higher level than their male counterparts. It should be noted that these two factors were also the highest rated factors in regard to influence for both male and females. Student ratings on these items did indicate the need to have teachers and school personnel, such as guidance counselors, who can present information in a knowledgeable manner and encourage students to consider various career options. Both male and female students rated each of the other three factors in a similar way.

Table 1: One-Way ANOVAs for Factors Influencing Career Options

Source	Male Students (n = 55)		Female Students (n = 62)		p
	Mean	SD	Mean	SD	
Part A: How much you feel each of following influences your thinking about future career options?					
Friends	3.13	1.26	3.05	1.16	.73
Parents	4.16	1.19	4.27	0.98	.57
Teacher	3.78	1.06	4.16	0.91	.04
Negative Teacher	2.13	1.16	1.81	0.96	.10
Cost of degree	3.60	1.16	3.42	1.39	.45
Time to degree	3.16	1.24	3.16	1.28	.99
Earning potential	4.02	1.09	4.18	1.00	.41
Interests in area	4.56	0.76	4.66	0.73	.48
Stay in region	2.44	1.23	2.50	1.40	.79
Media	2.67	1.25	2.74	1.20	.76
Part B:					
Friends with same interests	3.44	1.19	3.44	1.07	.98
Same-sex friend with same interest	2.93	1.10	3.10	1.14	.41
Someone in family in a specific field	2.98	1.23	3.14	1.19	.50
Teacher encourages me to think about a particular field	3.64	1.14	4.03	0.98	.05
Someone at school knowledgeable about different career options	3.80	1.13	4.37	0.92	.01

On the second questionnaire, students were asked to indicate which advanced math and science courses they planned to take during their high school careers. Results for this question, posed both prior to beginning the summer academy (pre-academy) and at the end of the academy (post-academy), are provided in Table 2. The courses listed on the questionnaire are part of the North Carolina High School Curriculum. A large percentage of both male and female students indicated they were planning to take Algebra I, Algebra II, Geometry and Pre-Calculus, if they had not already done so (some students did not differentiate clearly between courses they had taken and those they were planning to take for Algebra I, so the total number exceed sample size for this particular course). Based on student responses, the number of students indicating they were going to take these four courses increased after completing the academy. The most noticeable increases from pre- to post-academy were for Pre-Calculus and AP Calculus. Both values increased for each gender group from pre- to post-academy. Only a small percentage of male students indicated the likelihood of taking Advanced Functions (number actually decreased from pre- to post-academy for males) while a higher number of female students indicated this as a possibility both pre- and post-academy. No female student indicated the likelihood of taking Discrete Math and only two males pre-academy and one male post-academy indicated this as a possibility. The lower number may have also been due to a lack of student understanding of the definition of Discrete Math and/or the ability to offer this course in many rural school systems due to limited resources. It simply may have not been a viable option for most students.

Table 2: Student Plans to Take Math Courses – Pre- to Post-Academy Comparisons

I plan to take...	Pre-Academy (n)	Post-Academy (n)	Have taken (n)	Change Pre- to Post- Plan
Algebra I	13 m = 4 f = 9	24 m = 12 f = 12	111 m = 53 f = 58	m = 8 f = 3
Algebra II	62 m = 32 f = 30	67 m = 35 f = 32	38 m = 18 f = 20	m = 3 f = 2
Geometry	42 m = 22 f = 20	43 m = 22 f = 21	66 m = 30 f = 36	m = 0 f = 1
Pre-Calculus	54 m = 26 f = 28	75 m = 38 f = 37	10 m = 7 f = 3	m = 12 f = 9
AP Calculus	40 m = 21 f = 19	55 m = 28 f = 27	2 m = 1 f = 1	m = 7 f = 8
AP Statistics	13 m = 8 f = 5	20 m = 10 f = 10	2 m = 0 f = 2	m = 2 f = 5
Advanced Functions	17 m = 7 f = 10	20 m = 3 f = 17	2 m = 2 f = 0	m = -4 f = 7
Discrete Math	2 m = 2 f = 0	1 m = 1 f = 0	0 m = 0 f = 0	m = -1 f = 0

When asked about science courses they planned to take, high school students indicated gains from pre- to post- academy for all courses except AP Biology and AP Environmental Science. For these courses the number of students indicating likelihood of taking them actually dropped from pre- to post-academy. This was seen for both genders in regard to AP Biology and AP Environmental Science. The largest gain was seen for both male and female students indicating the likelihood of taking Physics or AP Physics. Results are presented in Table 3.

Table 3: Student Plans to Take Science Courses – Pre- to Post-Academy Comparison

I plan to take...	Pre-Academy (n)	Post-Academy (n)	Have taken (n)	Change Pre to Post Plan
Physical Science	40 m = 17 f = 23	44 m = 23 f = 21	53 m = 24 f = 29	m = 4 f = 2
Biology	39 m = 21 f = 18	43 m = 25 f = 28	23 m = 8 f = 15	m = 4 f = 10
AP Biology	38 m = 18 f = 20	29 m = 11 f = 18	6 m = 3 f = 3	m = -7 f = -2
Chemistry	31 m = 14 f = 17	73 m = 34 f = 39	7 m = 3 f = 4	m = 20 f = 22
AP Chemistry	9 m = 3 f = 6	25 m = 9 f = 16	32 m = 15 f = 17	m = 6 f = 10
Environmental Science	10 m = 5 f = 5	17 m = 10 f = 7	44 m = 19 f = 25	m = 5 f = 2
AP Environmental Science	22 m = 11 f = 11	10 m = 4 f = 6	5 m = 4 f = 1	m = -7 f = -5
Physics	17 m = 9 f = 8	48 m = 18 f = 30	0 m = 0 f = 0	m = 9 f = 22
AP Physics	3 m = 1 f = 2	22 m = 11 f = 11	0 m = 0 f = 0	m = 10 f = 9

One of the most notable increases was seen in female students indicating they would take Physics post- academy (8 pre- to 30 post-academy). The number of both male and female students indicating they likelihood of taking AP Physics also increased (1 to 11 and 2 to 11, respectively). Based on student reports as seen in Tables 2 and 3, the academy seemed to have a positive impact on encouraging high school students to consider enrolling in upper level math and science courses.

The third questionnaire asked students to indicate their interest in the fields of science, engineering and information technology both pre- and post-academy. Students rated their interest on a four-point Likert scale ranging from 1 (not at all) to 4 (a lot). A repeated measure design was used to determine if significant differences existed pre- vs. post-academy for student reports on each one of these career options. Gender was the between subject variable; pre- and post-academy ratings on interest in each of the three career fields served as within subject variable.

Table 4: Level of Self-Reported Interest in Working in Science, Engineering, and Information Technology

Source	df	Mean Square	F	P	Partial Eta Squared
Science					
Gender (A)	1	3.19	2.28	.13	.02
Error	112	1.41			
Pre-Post Academy (B)	1	1.57	3.53	.05*	.03
A x B	1	0.59	1.44	.23	.01
Error	112	0.39			
Engineering					
Gender (A)	1	3.51	2.73	.10	.02
Error	112	1.29			
Pre-Post Academy (B)	1	1.03	1.69	.19	.02
A x B	1	0.39	0.66	.42	.01
Error	112	0.61			
Information Technology					
Gender (A)	1	1.97	1.42	.24	.02
Error	112	1.38			
Pre-Post Academy (B)	1	0.24	1.01	.32	.02
A x B	1	0.24	1.01	.32	.02
Error	112	0.23			

As shown in Table 4, the academy provided a significant increase in student interest in pursuing a science career, but a significant effect was not realized between subject effect for gender, nor was a significant interaction effect found for gender by pre- post-academy. Overall, both male and female students reported an increased interest in the possibilities of a career in science after completing the academy. Means and standard deviations are presented in Table 5.

Table 5: Pre- and Post-Academy Means and Standard Deviations by Gender for Level of Self-Reported Interest in Working in Science, Engineering, and Information Technology

Source	Pre-Academy		Post-Academy	
	Mean	SD	Mean	SD
Science				
Male Students (55)	3.21	0.92	3.27	0.91
Female Students (59)	2.86	1.02	3.14	0.97
Total (114)	3.02	0.98	3.20	0.94
Engineering				
Male Students (27)	2.89	1.03	3.15	0.98
Female Students (25)	2.73	0.89	2.81	0.97
Total (52)	2.81	0.96	2.97	0.99
Information Technology				
Male Students (27)	3.07	0.81	2.87	0.90
Female Students (25)	2.74	0.83	2.79	0.96
Total (52)	2.88	0.83	2.83	0.92

Next, students were asked to indicate their interest in pursuing a career in engineering and information technology pre- and post-academy. No significant main or interaction effects were found. Both female and male students came into the academy indicating a strong interest in pursuing an engineering or information technology major in college, and this was also the pattern at the end of the academy as well.

The results from the ITEST program conducted for the rural area students indicates that major gender differences were not seen in interest in working in science, engineering or information technology. Both male and female students entered the academy with interest in these areas as can be seen from Table 5. No significant interactions were found based on gender and pre- and post-academy in terms of interest in working in any of the three fields. There was, however, a within-subject main effect for science. Students expressed a significantly higher interest in working in the field of science post-academy.

Future research is planned to track former participants in the academy to determine if there is an impact on high school course selections, their choice to go to college, and if they do pursue a college major in a STEM field. Markowitz (Knox, Moynihan, & Markowitz, 2003; Markowitz, 2004) successfully tracked outcomes for an ongoing summer science academy, and both short and long term program data found that their academy had a positive impact on most of the students who participated. Future study of this ITEST program outcome warrants this follow-up investigation as well, especially to determine if the impact on female participants is significant to their career choices. There is definitely a need to pursue this and see if they take these courses

as we continue to lose a large number of intelligent, talented individuals who could make important contributions to the technology field (Blickenstaff, 2005).

Conclusions

There were many more similarities than differences between male and female high school students in regard to influences on career considerations and interest in working in the fields of science, engineering and information technology. However, whether or not these similarities will lead to increased numbers of females actually pursuing careers in these areas is still in need of follow-up. In looking at the courses female students indicated they would likely take pre-academy, they would not have the same skill set entering college to increase their potential to succeed in STEM majors. Increases were seen in female students indicating a higher likelihood of taking certain high school math and science courses after attending the academy (AP Calculus and Physics for example). If they do enroll in these courses now, they will certainly be in a better position to successfully complete a college program in one of the STEM areas without having to play catch-up.

So, to address the specific questions pursued in this investigation: (1) Were there gender differences in factors students reported as being influential in their interests and considerations of career options? Significant gender differences were found in regard to influences on career options. Even though male and female students rated these areas high in importance, female students rated the influence of a teacher significantly higher in making an impact on their perceptions of a future career choice than did their male counterparts. Female students also rated a teacher encouraging them to think about different career options and having someone at their school who was knowledgeable about different career options significantly higher than male students in their current interests. Perhaps, as Kekelis et al. (2005) noted, parents should take a more active role in guiding choices in technology fields especially for girls. It is also important that there be someone at the school who is knowledgeable about STEM careers. Parents, teachers, and school personnel such as counselors have unique opportunities to influence both male and female high school students, but extra efforts need to be expended to insure females are presented with information on non-traditional career options. (2) Did the academy influence female students to consider taking more advanced science and math courses at the high school level? Yes, the academy was successful in increasing interest, most notably in pre-Calculus, AP Calculus, Advanced Functions, Biology, Chemistry, AP Chemistry, Physics and AP Physics. Gains were seen for both male and female students in their reported likelihood of taking more advanced courses after attending the academy. If these students follow through, these added courses will allow these students to enter college with a strong background in science and math and give them an added edge in succeeding in the STEM areas. (3) Did participation in the summer academy serve to increase the interest of male and female students in pursuing careers in science, engineering, and information technology? Partially; the only significant pre- post-academy difference was seen in science. There were no significant differences for either engineering or information technology. There were also no significant gender differences in expressed interest in these areas pre- or post-academy. However, in

looking at the mean ratings of male and female students, they both came in with a strong expressed interest.

There are several limitations of the current study that should be noted. The sample represents a relatively small group of students in rural, eastern North Carolina and generalizations to other populations needs to be made with caution. The focus of the current study was on students from lower SES background as well as rural school systems that may also limit generalizations. However, it should also be noted that the students participating in this study represent young adolescents who were identified by their respective schools as having the ability to do well in the STEM fields and were nominated by their schools to attend the academy. These students reflect a potential, but often overlooked, resource for recruitment in science and technology fields.

In summary there were some differences in factors influencing STEM fields based on gender, but there were also many similarities. In general, the influence of parents and teachers is critical for STEM career decisions. The question then becomes why do females still represent such a lower percentage of the workforce in some of these areas such as engineering? Work must continue to attract female students into fields such as engineering and retain them in order to increase the current 9% of females working in engineering fields. In looking at the gender gap, we may be narrowing the gap and lessening the likelihood of the female student entering college already at a disadvantage in math and science. In order to improve student selection of science, engineering and information technology careers, there must be solid, consistent efforts in order to increase comprehensive awareness and understanding of STEM fields.

Appendix

Survey Form for Student Interests

Career Interest Survey Form					
Please rate the following in terms of how much you feel they have influenced your thinking about future career options using the following rating scale:					
	very strong influence	strong influence	Somewhat important influence	minor influence	no influence
My friends	5	4	3	2	1
My parents	5	4	3	2	1
The encouragement of a really good teacher	5	4	3	2	1
Lot of importance but in a negative way, a teacher	5	4	3	2	1
Being able to afford college	5	4	3	2	1
Time it takes to complete program in certain field	5	4	3	2	1
The future earning potential of a career choice	5	4	3	2	1
How the career choice fits with my interests	5	4	3	2	1
Choosing a career so I can stay in eastern North Carolina	5	4	3	2	1
What I see in the media about careers (i.e., movies, TV)	5	4	3	2	1
PART B: How important are the following in the interests you have?					
	Very Important	Important	Somewhat Important	Very little Importance	Not Important
Having a friend with similar interests.	5	4	3	2	1
Having a same-sex friend with similar interests.	5	4	3	2	1
Having someone in my family who is in a particular field.	5	4	3	2	1
Having a teacher who encourages me to think about a particular field.	5	4	3	2	1
Having someone at my school who is knowledgeable different about career options talk with me about possibility of careers.	5	4	3	2	1

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HOW TO COLLABORATE IN A VIRTUAL WORLD: TEACHING TEAMWORK AND TECHNOLOGY

Mahatapa Palit and Christopher Stein

Borough of Manhattan Community College – The City University of New York

New York, NY 10007

ABSTRACT

Today's organizations leverage the opportunities offered by widely available information and communication technologies to bring together geographically dispersed people with different knowledge and skills. As our students step into their professional lives they need to have the skills to succeed working in such virtual teams. This paper outlines an experimental curriculum in which college students from a marketing class teamed with students from a multimedia class to work on a common project. The curricular goal was to help students gain team experience and skills in an interdisciplinary team setting that simulated the real world. A scale that measures team knowledge was given at the beginning and end of the classes, the results of which showed no significant difference ($t=-.29$). This paper looks at the reasons for the results, lessons learned from this experimental collaboration, and discusses curricular components that may facilitate the development of technology-mediated teamwork skills in students.

Navigating a Flat World

In the last ten years the rise of the Internet and related technologies have created new, faster and less expensive ways for people to communicate with each other. Not surprisingly organizations across the globe have taken advantage of this trend to improve how, where and how fast they work. As organizations become geographically dispersed, there is an increasing amount of work done by virtual teams, teams who do not meet in person and rely on information and communication technology (ICT). Such teams carry out many critical functions, including information collection and dissemination, decision making, and implementation (Canney-Davison & Ward, 1999). However, they also bring with them new challenges in communication, cultural norms, leadership, performance evaluation and other areas.

Technology can both rise to meet these challenges and contribute to them. These virtual teams could not function without the Internet, low cost communications and advanced ICT such as web-based chat and conferencing tools, e-mail, collaborative writing tools, group decision support systems and workflow automation systems. As information and communication technologies permeate every aspect of organizational and personal life they challenge us, changing how we interact. Professionals and those studying to become professionals need to adapt to be successful.

Are our students ready to be a part of this trend? In order to succeed in such a work environment it is necessary for students to learn how to work in teams mediated by these technologies. Harvard and MIT economists Richard Murnane and Frank Levy explain that in the future "good jobs will increasingly require expert thinking and complex communication. Jobs that do not require these tasks will not pay a living wage" (Levy and Murnane, 2004). It is increasingly likely that "expert thinking" and "complex communication" will make use of some form of ICT and that the jobs will be as part of a team or teams. To be ready for this trend students need both technological and collaboration skills.

Technological Skills

Studies show that student use of ICT is high and rising (Salaway et al. 2006, 2007). The newest generation of students is steeped in communication technology, many using it on a daily basis. They email, chat, send text messages, post videos on YouTube, share pictures on Flickr, and network with friends on MySpace and Facebook. And there is surely more to come. The 2007 ECAR Study of Undergraduate Students and Information Technology found that the average student spends 18 hours a week online. While online, 99.9% of them use email, 84.1% use Instant Messaging and 81.6% use social networks such as Facebook, up from just over 70% a year ago. In addition, the median frequency of use for those who participate in social networks was daily use. This use of social networks also shows how fast students adopt new technologies. When the same study was done in 2005 social networking was not even included in the study. Evidence like this supports claims by those such as Mark Prensky that students are indeed "Digital Natives," (Prensky 2001) comfortable using these technologies and expecting to use them in their student as well as personal life. However, the question remains as to whether this familiarity with ICT actually translates into effective interpersonal communication and collaboration skills when those skills are needed to do "work" with teams, especially virtual teams.

Collaboration Skills

Industry representatives emphasize that recent graduates should have developed abilities to work in teams, to communicate effectively, to think critically, and to solve open-ended design problems (Black 1994; Coleman 1996). Academics agree. Murnane and Levy (1996) describe the essential skills necessary for today's generation to be successful in the workplace. Apart from basic academic and computer skills these include (a) the ability to solve semi-structured problems where hypotheses must be tested, (b) the ability to work in groups with persons of different backgrounds, and (c) the ability to communicate effectively, both orally and in writing.

What are the skills necessary for successful collaboration? A conceptual model developed by Stevens and Campion (1994) focused on knowledge, skills and abilities (KSAs) that make individuals more effective in teams. Based on review of extant literature they suggested that interpersonal factors such as conflict resolution, collaborative problem solving, and communication and self-management factors such as goal setting/performance management

and planning/task coordination are important for effective team performance. Interpersonal KSAs were generally defined as skills necessary to maintain healthy working conditions and to react to others ideas with respect, emotions, and differing viewpoints. Self management KSAs encompassed the abilities that team members must have to perform managerial activities such as goal setting and planning. Their measure of teamwork KSAs has been found to hold in different settings, including temporary student teams (McClough & Rogelberg, 2003) and has been recently extended to include components of trust, reliability and intercultural competency (rather than on personality traits or dispositions as characteristics) to develop a measure for selection and placement of members in virtual teams (Hertel, Konradt & Voss, 2006).

Collaborative Exercise

To address the need for technological and collaboration skills in today's students we modified two existing courses, a marketing class from the business field and a multimedia class from the field of technology. We used these two courses because they are both in professionally oriented fields, the interdisciplinary aspect of the project would parallel teams common in the real world and the skillsets of the students in the two classes complemented each other well for a hands-on project. The overall objective of the curriculum restructuring was to provide a setting for students where they could gain experience working in face-to-face and virtual teams and gain teamwork knowledge.

The curriculum planned for collaboration at two levels: within group collaboration and between group collaboration. Students in both the Marketing class and the Multimedia class were divided into an equal number of groups. Then each group in a class was paired with a sister group in the other class. Intra-class groups would communicate largely face-to-face and inter-class groups would communicate virtually. The students were briefed by a client (in this case the career center) on a project that had to be completed by the end of the semester. The project was the creation of a learning object that was modular in nature and expressed as a web site. The Marketing students were responsible for developing the business specifications and much of the written content and the Multimedia students were responsible for developing the visual design, graphic elements and web pages. Each of the paired-groups was responsible for one module of the project.

In order to develop a module of the learning object, Marketing students responsible for that particular module would have to engage in close intra-group collaboration to write out and develop the business specifications for the module. They would then communicate this to their sister group in the Multimedia section using email and a web-based collaborative tool. That group of Multimedia students would then work closely with each other to create the graphic design, integrate the content and write the HTML and CSS to develop a web-based module of the learning object.

A number of steps were undertaken by the researchers to ensure that the groups were well-formed and part of the overall course curricula. The groups were chosen by the instructors with

efforts to create relatively equal groups with diverse backgrounds and skills. Clear roles were outlined for the group members (the students themselves chose who would fill the roles), and a general timeline with deliverables was laid out. The inter-class workflow was also with the students. The groups were integrated into the curricula through various means. Group assignments were included in the curriculum and were part of the final grade for the courses. A technology was chosen by the researchers to facilitate the interclass communication. Class time was used to demonstrate the technology and train students in its use (the technology, JotSpot has since been bought by Google). Students had time during class to work in groups with access to computers so they were able to use this technology during class time when the instructors were available for assistance.

Effectiveness of the Exercise

In order to assess whether the collaborative exercise increased students knowledge of how to work in teams, students were given a teamwork knowledge test at the beginning and then at the end of the semester. We used the team knowledge test (TKT) developed by Sims-Knight et al. (2002), based loosely on the format used by Stevens and Campion (1994) for their Teamwork KSA Test. The TKT is a measure intended to assess individual team members' general knowledge of team issues and concepts. The current test was designed for use with an undergraduate college population rather than an industrial or corporate population which made it particularly attractive for the present study. Its 20 items are designed to sample students' understanding of four domains -- team process, decision making, communication, and conflict resolution.

This test presents a series of hypothetical situations in which the respondent is asked to choose the best response from among several options. Some examples of the items used in the TKT test would be 'Your team leader comes to your scheduled meeting without an agenda. What should you do?' The four response options for this question are:

- 1) *Make your first agenda item developing an agenda as a team.*
- 2) Let the meeting proceed without an agenda.
- 3) Tell the team leader to write out an agenda right now and take the rest of the team for coffee until s/he is done.
- 4) Suggest the meeting be postponed until the team leader gets his act together.

Another example follows: 'When receiving feedback from your team members, it is generally useful to...' The response options for this statement are:

- 1) Have an argument prepared ahead of time to defend yourself.
- 2) Anticipate that people won't really understand where you're coming from and be ready to explain.
- 3) *Try to perceive the feedback as information that you can use, not an evaluation of you as a person.*
- 4) Anticipate what they will say and wait to hear it.

The developers reported relatively high reliability coefficients for the TKT scale [pretest: Cronbach's alpha = .78; post-test: Cronbach's alpha = .76] (Sims-Knight et al. 2002). Thus the developers of the scale recommended that it would be valid to calculate an overall score for the TKT scale. The overall score can be interpreted as the amount of teamwork knowledge an individual possesses because it reflects knowledge of how to act in team situations.

While the test is designed so that participants can receive an overall teamwork KSA score (Sims-Knight et al., 2002) we looked at differences between the total score and also individual items because in our case the reliability coefficient was somewhat lower, with Cronbach's alpha being .64 for pre-test and .67 for post-test.

Results

The scores were summed to get an overall pre-test and an overall post-test score. On each item of the team knowledge test (TKT) students received a '1' for a correct answer and a '2' for an incorrect answer. Thus, a lower overall score meant more correct answers and implied greater team knowledge. A paired t-test was run to examine if there was a significant difference between pre- and post-test scores. Results did not indicate a significant difference ($t(1, 21) = -.29; p > .1$)

Table 1: Mean Overall Scores on Team Knowledge Test

	Mean	N	Std. Dev
Pre-Test	25.68	22	3.77
Post-Test	25.91	22	3.29

Since the reliability coefficient of the TKT scale was not as high as those reported by the authors, we also examined differences between pre- and post-test scores for individual items using a Wilcoxon test, a paired non-parametric test. Results, again, did not indicate significantly greater team knowledge on any of the individual items.

A count of correct answers indicated that 54.5% improved from the pre-test to the post-test, 41.0% did worse and 4.5% remained the same. The average number of items correctly scored on the pre-test was 13.36 while the average number of correctly scored items on the post-test was 13.68.

Table 2: Comparison of Pretest vs. Posttest Scores

	N	%
Improved	12	54.5%
Same	1	4.5%
Worse	9	40.9%

The TKT scale was meant to measure four domains: team process, decision making, communication, and conflict resolution, areas that are considered important for collaboration. Varimax factor analysis of both the pretest and post-test scores did not reveal any clear factor structure that reflected these domains.

In addition to the empirical data we collected we also observed the students during the class time allotted for them to work in groups. While a formal methodology was not used, some interesting observations were made. Overall students struggled with basic project management skills. This included day-to-day activities like setting meeting agendas, and progress updates, and the more overarching strategic skills such as looking for bottlenecks and dependencies and contingency plans for events like absent group members or missed deadlines. A significant number of students (although still in the minority) held paying jobs outside of school where they had been exposed to project-based work or some of the related activities like meetings and deadlines. These students seemed to have a better grasp of what needed to be done to manage a project. However, problems still arose when they got frustrated with other students who didn't have the same understanding or experience.

Another observation was that all students, even the business savvy ones, appeared to have trouble knowing how and what to communicate in the context of the project. One of the big problems seemed to be the lack of norms related to how much information to communicate and how often to communicate it and what tone to use. On more than one occasion when stalled teams were asked what the problem was they replied with something along the lines of "we sent the other team an email/JotSpot update and they did not get back to us."

Based on our observations it was clear that while the students did not have a problem with using technology itself (email, JotSpot, IM and others they used), they did have a problem using technology to effectively communicate and work within and across groups. It appeared that transfer of effective use of ICT tools from one domain to the next (personal life to class team) is not a simple matter.

Discussion

Because of the small sample size used in this study (N=22), the results are not conclusive nor are they broadly generalizable. There are several possibilities for why no improvement was seen in the TKT scores and for the difficulties we observed. One possibility is that the TKT scale itself needs further development. Factor analysis of both the pretest and post-test scores did not reveal any clear factor structure. The scale was meant to measure team process, decision making, communication, and conflict resolution, areas that are considered important for collaboration. More work may need to be done to ensure that the scale actually measures these areas and that the items in the scale correlate with behavioral measures of these different domains of collaboration. However, we believe there are other, more significant, reasons for the lack of a significant difference between pre-test and post-test scores.

The lack of improvement between students' pre and post-test scores in team knowledge and their observed difficulties could also be explained because of the absence of some specific interventions in the restructured curriculum. This absence may have been the result of two implicit assumptions that we made while setting up the course that then hindered the students from gaining more teamwork skills.

The first implicit assumption was that students' familiarity with various information and communication technologies would help them with inter- and intra-class communication and with the web-based tool we used for interclass communication. This assumption fails to acknowledge that a technology serves a larger purpose and in order for the technology to be used effectively the larger purpose must be clearly understood. In our case the students did not have a good grasp of the collaboration skills needed for the given project. Because of our assumption we did not include any lessons or exercises to show the students how they could transfer their existing ICT skills to the context of their group projects.

Our second implicit assumption was that students would get better at teamwork just by working in teams. Unlike earlier studies that used this scale (Sims-Knight et al. 2002, Powers et al. 2002) we did not specifically teach students these types of teamwork skills either by giving them assigned readings on team skills or engaging them in team-building exercises. We created a curriculum that required students to work on hands-on projects in teams, and supported them with in-class time and communication technology, but it was not enough. The teamwork assessment we used showed no improvement. This suggests that getting students together in teams, however well supported, is not sufficient to help build their knowledge of how to collaborate. Other research agrees with the idea that teams alone are not sufficient (Vik, 2001).

This second assumption led to a lack of directed interventions in the curriculum design: we did not provide exercises or assignments focused explicitly on improving the teamwork knowledge, skills and abilities of the students. There are three activities in particular that were not present: 1) explicit teaching of knowledge and theory related to teamwork, 2) setting and discussing norms and behavioral standards, 3) feedback on or formative assessment of the groups.

Teaching teamwork skills and theory at the beginning of the course would have set a foundation for further practice and discussions of teamwork throughout the course. Making team-knowledge an essential part of the course content and helping students practice this knowledge in team-building exercises may be a necessary pre-requisite for success. However, it may be a necessary but not sufficient requirement for students to learn teamwork. For example, Sims-Knight et al. (2002) also found no difference between pre- and post-test scores on the TKT scale even though students had readings on effective team functioning, homework assignments on the readings and two team-building exercises.

Another necessary prerequisite may be norms. For teams to function effectively it is necessary for them to develop norms and expectations related to communications and feedback, set and monitor goals related to team product, manage conflicts, and develop effective team problem-solving skills. Norms and behavioral standards are important in any collaborative venture. They touch on how to behave in all four of the areas outlined by Stevens and Campion. In both personal life and in professional environments these norms are often well established in a culture. In the workplace people learn these norms through feedback from co-workers already familiar with them, bosses and customers. In an educational setting and especially in group projects in an educational setting there is not usually an existing culture to rely on and not the same opportunities for feedback. If norms are not established, modeled and brought up for discussion by the team and the faculty then they will develop in an ad hoc and not necessarily productive manner.

Feedback and formative assessment of adherence to norms and the performance of the groups are important for students to gain new skills. While people do internal checks of their own as they work in groups, relying on this informal self-assessment falls into the trap of our second assumption, that students will get better at teamwork just by being on a team. What is missing is a mechanism where students and groups are required to do self-assessment using more formal criteria and complete the assessment cycle by reflecting on the results, putting together an action plan for improvement and starting the cycle again. Faculty assessment of groups' collaboration skills would also be beneficial during the course of the semester. Sims-Knight et al. used a self-assessment inventory they call the Team Process Check (TPC). Using the TPC the students scored their teams on processes, decision making, communication and conflict. However, students did not reflect on the results of the assessment and make a plan of action to improve team functioning based on the assessment. In their suggestions for improving the process Sims-Knight et al. suggest using the PTC in this way may have helped improve their students' teamwork skills.

In short, we did not clearly explain what good teamwork was, show what good teamwork looked like in action, and give the teams opportunities for feedback, self-assessment (including reflection and action on the assessment) and assessment by the faculty on their teamwork skills during the course of their projects.

Recommendations for the Future

As previously mentioned, due to the small sample size and lack of significance in the test scores, we can not offer principles or conclusive results. However our results and experiences combined with the current literature lead us to offer two recommendations for those who plan to include technology-mediated collaborative projects in their teaching. The first recommendation is to recognize that it is not information and communication technologies alone that makes or breaks collaboration. It is in fact the underlying communication and project management skills in combination with technology skills that drive effective teamwork. Much has been written about the "digital native" students who are learning, playing and communicating in new ways through technology and their "digital immigrant" teachers who don't quite get it all (Prensky, 2001, 2005; McHugh, 2005). An implicit or explicit theme is that teachers need to "get with already" and master the new technologies. While we believe that keeping up with technological innovations is important, we feel that the race to keep up and the discussions it fosters hide the need students have for more foundational, non-technical, skills and knowledge about collaboration. These core skills and knowledge are what allow students to effectively use their technological skills in academic and professional settings. It is great if students can set up a blog or wiki or post video online. But if they don't know what is needed for good teamwork, then those technical skills alone will not help their teams function more effectively.

The second recommendation is to make teaching, practicing and assessing teamwork skills an important part of the curriculum. It's not good enough to just put students in teams and hope for the best. If students are to improve their collaboration skills, those skills must be an explicit part of the curriculum. The following are three practical steps towards creating such a curriculum.

Step 1: Provide Foundational Knowledge on Important Collaboration Skills

The first step is to teach foundational knowledge of collaboration at the beginning of the course. Most traditional students entering college do not have much experience working in teams and therefore need to be provided with knowledge regarding how teams work and the skills that are salient to collaboration. One example of the kind of core knowledge to cover is the aforementioned four areas of team skills outlined by Steven and Campion (1994). The curriculum should cover how to make decisions, manage conflict, create communication networks, identify problems and develop solutions and develop decision making processes that allow all members to participate and voice their opinions. The teaching should also allow students to ask and answer questions such as: Is conflict bad? What happens when members have different goals and expectations? How do you facilitate creativity in a team? What is the best way to provide feedback? What tools can be used to facilitate team coordination?

Step 2: Set Norms and guidelines on behaviors

The second step is to set and model norms and behavioral guidelines. In order to be effective in team settings, members should be given norms, guidelines and training on what personal

actions they can and should take to facilitate teamwork. Many students freeze at the first sign of conflict – they need to recognize when conflict is healthy and when it is not. Also they need to be shown what they can do to develop solutions and negotiate trade-offs to manage conflict. They need guidelines on when to practice brainstorming to generate good ideas and what criteria to use to short-list from these ideas. They need to be provided guidelines for consensus building, fostering trust and developing benchmarks for effective communications and coordination. These should be seen as a starting point for the students and not commandments in stone. Through the assessment process in the next step students should be able to evaluate and modify these norms.

Step 3: Weekly self-assessment process

The third step is to put in place a formative assessment process. This process should be based on the previous steps and also serve as a way to document the teams in action. Team processes are dynamic and it takes time for a group of people to emerge as a strong team. Thus, for teams to work well, it is necessary to assess and monitor both individual as well as team performance, setting group goals that are in congruence with individual goals. This assessment should also incorporate mechanisms for clarifying the norms and expectations of these team behaviors on an ongoing basis. Weekly documentation of team processes and decisions can be used for assessment purposes and allows the team to reflect on what works and what needs to be changed. Since these team dynamics underpin effective team performance, it is recommended that students be rewarded for completing these assessments. The weekly self-assessment can also be used by the faculty to monitor teams' progress and can serve as a tool for intervention if a team falters.

Conclusion

Teamwork and collaborative skills play a vital role in today's workplace: a role that will only continue to gain in importance. In addition, information and communication technologies (ICT) have revolutionized the way collaboration happens. As educators we must prepare our students to enter this world. Many educators respond to this challenge by assigning team projects and collaborative exercises. While this is important, the results of this study indicate that simply putting students in teams and requiring the use of ICT will not make them, necessarily, better at teamwork. We recommend that the curriculum also includes explicit teaching, modeling and assessment of teamwork skills and knowledge.

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**READING TO LEARN ON THE INTERNET:
CHALLENGES, SOLUTIONS, AND IMPLICATIONS**

Xiufang Chen

Rowan University

Glassboro, NJ 08028-1701

Pamela Halsey

Texas Tech University

Lubbock, TX 79409

ABSTRACT

This study explored the use of Internet texts in a fifth-grade language arts/social studies classroom. It investigated the challenges the teacher and students encountered when reading Internet texts, solutions for overcoming these obstacles, and the participants' perceptions of using the Internet to learn social studies. A qualitative case study strategy was used in the collection and analysis of the data. Participants were nineteen fifth-grade students and their social studies teacher who had received training in using the Internet in classroom instruction. Data was collected through interviews with the teacher, focus group interviews with the students, classroom observations, and students' artifacts. Data was analyzed using the constant-comparative method. While the content studied is social studies websites, the information presented is appropriate for intermediate teachers of all content areas who are interested in incorporating Internet texts in their instruction.

Introduction

Access to the Internet is now widely available in schools. Navigating the Internet has become an essential literacy skill for today's middle school students (Eagleton, Guinee, & Langlais, 2003). According to the National Center for Education Statistics, ninety-eight percent of U.S. public schools and seventy-seven percent of classrooms in those schools were connected to the Internet by Fall 2000 (2001, online document), and in 2003, ninety-three percent of all k-12 classrooms in the U.S. had Internet access (Parsad, Jones, & Greene, 2005). Seventy-one percent of teens said they relied mostly on Internet sources for the last big project they did for school, and thirty-four percent of online young people ages 12-17 downloaded study aides from the Internet (Lenhart, Rainie, & Lewis, 2001). "Because of technology, our definition of reading has changed to include websites, e-books, e-mail, discussion boards, chat rooms, instant messaging, and listservs" (Schmar-Dobler, 2003, p. 81). Increase in access to the Internet has led to an increase in the texts available to students.

Educators in today's world might agree that the concern of using the Internet as an instructional tool in classrooms is not whether or not to use it, but how to use it "effectively" and "responsibly" to help students of all ages (Dobrick, 2008). Many researchers and educators in the past have studied the use of the Internet in classrooms (Conklin, 1986; Dobrick, 2008; Eaton, 1999; Kamil & Lane, 1998; Pye & Sullivan, 2000/2001; Rice & Wilson, 1999; Scott & O'Sullivan, 2000; VanFossen, 1999/2000; VanFossen & Shiveley, 2000), however, little attention has been given to the reading aspects, that is, whether and how students comprehend content information when reading on the Internet. The demands of reading Internet texts are different from reading print texts, especially when considering the unique features of Internet texts such as various authors, multiple readability levels, hypertexts, and video and audio clips (Coiro & Dobler, 2007). Among the few studies focusing on reading aspects, attention has been given to either the teachers or the students (Altum, 2000; Coiro & Dobler, 2007; Karchmer, 2001; Schmar-Dobler, 2003), rather than looking at a class as a whole and exploring the perceptions of both the teacher and students. Finally, many of the above studies used quantitative methodologies, rather than observing what the class was actually doing and talking with the teacher and students about their perceptions of their learning experiences.

The purpose of this qualitative case study was to explore the reading aspects of using Internet texts in classrooms. More specifically, this study set out to investigate the reading challenges nineteen students in a fifth-grade social studies class encountered when reading on the Internet, the solutions they came up with under the guidance of the teacher for overcoming these obstacles, and the perceptions of both the teacher and students towards these learning experiences. The following questions guided this study:

- 1) How do a fifth-grade teacher and her students use the Internet in their social studies classroom? What challenges have the students encountered when reading to learn on the Internet, and how do they resolve these challenges?
- 2) What are the perceptions of the teacher and the students towards using the Internet in their social studies classroom?

Background

Like other subjects, reform efforts regarding social studies have emphasized changing the ways in which social studies have been taught and learned (Rice & Wilson, 1999). The NCSS (National Council for Social Studies) Curriculum Standards for Social Studies recommended that students be encouraged to process what they learn on several levels simultaneously (2002). From the very beginning, students need to be asked to make connections between new learning and prior knowledge, to think critically about information, or to use information to construct arguments or to make informed decisions (Rice & Wilson, 1999). Schools are expected to create a culture that values collaboration, promotes self-reliance, and prepares students with critical thinking skills. All of these recommendations, which might be challenges for some schools, can be accomplished through the use of the Internet in the instructional process. On the Internet,

“sophisticated computer simulations, instant access to experts, online research and publication, cross-cultural communication, virtual field trips, and access to a plethora of resources are present realities and critical inclusions in all future social studies curricula” (Eaton, 1999, p.139). The interactive and multimedia nature of the Internet can thus break down the classroom’s physical limitations and expand students’ experiences, develop students’ inquiry and analytical skills, and expand students’ experiences with visual technologies. The multiple perspectives offered by the Internet that often lack in traditional textbooks can also help students learn abstract historical concepts, and the capacity of the Internet to link classrooms worldwide provides a wealth of opportunity for students to use reading and writing in authentic contexts.

In spite of the potential and actual benefits of using the Internet in classrooms and the widespread proliferation of Internet users, few teachers have attempted to employ it in their classrooms to help students meaningfully understand content (VanFossen, 1999/2000). Among those who have Internet access in the classroom, some worry about the often overwhelming quantity of raw, unfiltered, and even possibly dangerous information; some are afraid of losing control of the situation while students surf on the Internet; some worry that the Internet leads to declines in social involvement and psychological well-being, and some are concerned that the Internet may lead students to acquire material of “marginal interest” (Pye & Sullivan, 2000/2001; Scott & O’Sullivan, 2000; Shiveley & VanFossen, 1999). Other teachers often lack the skills necessary to use Internet resources effectively. In addition to little training on computer use, they have little knowledge related to integrating the Internet into the classroom specifically (VanFossen & Shiveley, 2000). Often, lack of time and supervision and an overall sense of confusion become barriers to use the Internet in the classroom, along with limited funding, support, and remoteness of rural areas (Pye & Sullivan, 2000/2001; VanFossen, 1999/2000). Some solutions to these obstacles have been proposed such as training teachers in the skills and knowledge necessary for using the Internet as an instructional tool, providing students explicit tasks and directions for Internet use, using blocking software to control Internet content, and teaching students critical thinking skills (Pye & Sullivan, 2001).

When comparing reading printed texts with reading hypertexts on the Internet, students reading both formats adopted the same strategies such as skimming, scanning, evaluating, predicting, and rereading (Schmar-Dobler, 2003). Despite these similarities, when reading on the Internet, students face an abundance of choices by way of various hyperlinks, a larger amount of information, and a greater variety of information including texts, graphics, etc. (Conklin, 1986; Kamil & Lane, 1998), which require readers to adopt different reading strategies. Good Internet readers are found to use such strategies as creating a mental plan and applying more complex self-regulating skills (for example, going through the cyclical patterns of reading rapidly and repeatedly: planning, predicting, monitoring and evaluating) (Altum, 2000; Coiro & Dobler, 2007). Therefore, readers need both traditional skills and new skills associated with Internet reading to identify questions, locate, evaluate, synthesize, and communicate information on the Internet (Leu, et. al., 2004). Unfortunately, the new skills demanded by Internet reading

comprehension are rarely taught in schools (Karchmer, 2001; Leu, 2006), which creates another challenge for students reading to learn on the Internet.

The Study

Informed by a review of related literature and based on the nature of the research questions, a qualitative case study methodology was implemented in the collection and analysis of the data in this study. "Qualitative studies are best at contributing to a greater understanding of perceptions, attitudes, and processes." (Glesne, 1999, p.24) Case study methodology "involve(s) systematically gathering enough information about a particular person, social setting, event, or group to permit the researcher to effectively understand how it operates or functions" (Berg, 2001, p. 225). The understandings gained from case studies can not only affect but also improve practice, which is one of the final goals of this study. Merriam (1998) defined the qualitative case studies as being particularistic (focusing on a particular situation/phenomena and taking a holistic view of the situation), descriptive (providing rich, complete, and literal description of the incident being investigated), and heuristic (illuminating readers' understanding of a particular phenomenon by bringing new meanings, extending readers' experiences, or confirming what is known).

"Qualitative researchers neither work (usually) with populations large enough to make random sampling meaningful, nor is their purpose to produce generalizations." (Glesne, 1999, p. 29) The participants in this study were nineteen students and their social studies teacher in a fifth-grade social studies class in a southwestern school district in the U.S. Participants were selected purposively due to the fact that the teacher, Ms. Kelly (pseudonym) had received extensive training in using the Internet in classroom instruction. She had passed all of the district's required technology training courses and assessments, an accomplishment which earned her class additional technology resources such as a big screen television, a scanner, a printer, and two additional computers. In Ms. Kelly's class there were ten boys and nine girls, and about half of the students were Hispanic. They shared the three computers in the class, but they were always able to use the computer lab next door.

Throughout the semester, data were collected through classroom observations of daily social studies sessions, constant informal conversations and three semi-structured interviews with the teacher and students respectively at the beginning, middle, and end of the semester, and various documents including the participants' reading logs/notes and their research reports. Triangulation was thus assured through the large and varied volume of data sources. Data analysis was based on an inductive, naturalistic method as described by Lincoln and Guba (1985). During the analysis, the researcher read and re-read the data and looked for patterns and themes across all data. This inductive process allowed for themes to emerge and for participants' voices to be heard, thus presenting the perceptions of participants in the most forthright manner (Berg, 2001).

Results and Conclusions

Internet texts were used every day in a variety of ways in this class. While the participants believed that the Google search engine helped them find good websites, the websites they frequently used were: discoveryschool.com/schrockguide/ (links to subject areas), www.ncss.org/links/home.html (National Council for Social Studies website with links to conferences, teacher resources, and curriculum standards for social studies), www.pbs.org (links to lesson plans), <http://www.zoomschool.com/> (information about a region's geography, history, politics, and wildlife), and <http://www.50states.com/> (links to multiple web sites).

On the Internet, Ms. Kelly obtained resources including photographs and historical documents such as constitutions or signed contracts. She used these photographs and documents to create Power Point slides to help students learn about historically remote events or facts. In addition, she utilized video clips and audio clips from newscasts to help students learn about current events. When they were learning about World War II, the teacher guided students to some websites containing video clips and audio clips to help them learn the content through reading, listening, and watching that chapter of history. The Internet thus allowed Ms. Kelly to deliver more effective instruction of the content.

At the same time, she assigned students tasks that had to be completed by reading on the Internet. These assignments included activities such as reading a website students chose from a list of provided websites, completing a True/False statement chart to get prepared for the next class day, reading the same webpage chosen by the teacher in class and answering questions, and writing an inquiry or summary research paper based on what they learned on the Internet. Some of these assignments were individual work and many were group or pair collaborations. These assignments thus facilitated collaboration among students to construct understanding together.

Internet texts were used to help students to learn social studies in diverse ways. Many websites had videos clips which allowed the students to “experience” what they were learning. They conducted virtual field trips back in history or to some remote places. For those struggling readers, they could learn the content effectively through multiple media by listening to the content and watching its videos and pictures simultaneously. Internet texts were also the students’ dictionary with underlined new vocabulary leading to the definitions or explanations by simply clicking on them. Sometimes the students played educational games with their classmates, which helped them to reinforce what they had learned in class. Additionally, the Internet enabled them to communicate with experts around the world about certain topics. When they had questions about content on the Internet, they were often encouraged to post their questions and comments on the websites. The students were always excited when they received replies to their posts.

Challenges and Solutions

During the process of using Internet texts, the teacher and her students encountered some challenges, but they worked together to solve the problems. The biggest challenge for this group of students was confusion or loss of meaning due to poor website navigation. They felt confused when they went to incorrect websites or clicked on the wrong links. The teacher explained, "The textbook just gives you one point; when you're on the Internet, you got all the links. If you get to the wrong sites, it is quite confusing". Together, the class came up with these solutions: clicking back until where they recalled what they were supposed to do; making choices before clicking any links; and asking themselves "Why am I searching?" or "What do I want to know?" The teacher started by modeling these solutions on the big screen, and then the students practiced them in their research projects. During the practice, the teacher helped remind them of these strategies. Gradually, it became a habit for them to make decisions before clicking any link, and they were aware that they had to keep focused during the search process. The teacher believed that it was a trial-and-error process of learning since students had to make choices by themselves before doing anything. This finding confirms that, when reading on the Internet, students need to be taught critical thinking skills and it is necessary for them to create a mental plan and to apply more complex self-regulating skills (Coiro & Dobler, 2007; Pye & Sullivan, 2001). It also demonstrated how important it is to explicitly teach these skills in class (Leu, 2006).

The second challenge they encountered was difficulty understanding some Internet texts' vocabulary, text structure, and/or content. One student said, "The textbook is usually so context-based that it is easier to understand, though the Internet is faster." He also added, "You get more from the textbooks because it is explained in your point of view." The teacher admitted that Internet texts' diverse readability levels were barriers: "It is pretty difficult to find a fifth-grade level website because a lot of it is at an adult reading level." In order to help students get the most of their reading, besides searching for websites or Internet texts at the appropriate readability level, the teacher considered these moments as great teachable moments for her to conduct mini-lessons on reading comprehension strategies such as using context and text feature clues, finding the main idea, skimming and scanning, predicating and rereading. The class also took advantage of other approaches such as using teacher read-alouds for difficult portions of texts, working with partners, learning with higher-level students, asking for help from parents or the teacher, asking questions directly on the website, and clicking the explanation links. Among previous studies on Internet reading, the readability levels of Internet texts were rarely investigated. This study indicates that Internet readability levels may be a topic for researchers and educators to explore in the future.

The third challenge for the class was inappropriate content on some websites. The teacher explained that the "school filtered some websites and teachers choose together what kind of websites are appropriate, at least some, if not all." She was aware that they needed to "keep them [students] out of the inappropriate websites. It is illegal for a kid to be on the Internet without an adult's supervision at school." The teacher walked around and tried to screen every

website students accessed. But she also admitted that “the individual links at the bottom cannot keep them [students] out of [inappropriate] links. That is doubtful. But I think this is a trial-and-error thing. You just have got to do it. You cannot shelter the kids forever.” She continued, “But they [students] know if they click the inappropriate links, they will get into trouble. It is definitely critical thinking. They have to think ahead before they get to that link.” In order to help students make appropriate decisions, the teacher conducted several mini-lessons on how to select and evaluate websites based on the Internet research skills suggested by Leu, Kinzer, Coiro and Cammack (2004). Basically, students were instructed to keep in mind their searching purposes, check the URL addresses by asking themselves “Is this a .gov, .com, .edu, .net, or .org?”, and examine the authors by asking themselves “Who is the author?” (looking on home page, “about us,” at the bottom of the page, “contact us,” etc.), “Who is the audience for the site?” and “What is the purpose of this site?” Through practice and with the awareness of consequences, students became more and more cautious and skillful in selecting appropriate websites. This finding definitely raised an issue about effective adult supervision. Using blocking software to control inappropriate Internet content, teaching decision-making techniques (Pye & Sullivan, 2001), and helping students realize the consequences of reading inappropriate content on the Internet all helped with this concern.

The fourth challenge was distraction and poor reading comprehension caused by the inserted links. This challenge was not caused by poor website navigation as discussed earlier; rather, it was due to the nontraditional presentation of information compared to print texts. In print texts, information was presented in predictable patterns, and the students felt they were easier to follow. When reading Internet texts, however, students claimed it was difficult to follow what they were reading and to remember what they read within the inserted links. To solve this problem, the teacher sometimes guided students to read the passage first and then go back to click the explanations. At other times, students were instructed to read the linked explanations and skim over the whole passage if the explanations were critical to their comprehension. The teacher taught the students that they always needed to evaluate the text’s features and make their own decisions about which method to choose. Previous studies have indicated this challenge (Conklin, 1986; Kamil & Lane, 1998), but effective Internet reading strategies should be explored in depth, and these strategies should be taught systematically in schools.

Perceptions of the Teacher and Students

Reflecting on reading Internet texts in their classroom, both the teacher and the students believed that the Internet provided more updated content knowledge and more resources on a topic than their textbook. The teacher commented:

“...to have them [students] just read the book is funny (since the Internet can) immerse students in the war or whatever we were studying. Our textbooks are pretty out of date. I think (the Internet) is effective because, first of all, I think it is an incentive. It makes children excited. They love to be on the Internet”.

The teacher thought that it was impossible for students to understand current events or issues happening in the world from reading only their textbooks. However, on the Internet, they could learn about current events from a variety of perspectives and thus get a better understanding. She also stated that as time went by, perhaps people discovered something really did not happen the way it was described in a textbook, and students had found new information on the Internet.

Internet texts also provided more options to meet students' diverse learning styles. Some students such as English language learners and struggling readers relied more on illustrations, images, and/or audio texts to learn content; others preferred to get information by reading the texts. Using the Internet, students could easily choose their preferred media to learn the same content. For example, students could choose to listen to a historical event online or watch video clips of it while reading the online texts. Such choice is often impossible in a traditional classroom using textbooks only. Undoubtedly, the multiple media that Internet texts provide enhanced students' content understanding and learning. One student explained, "If you go to the Internet, they will read to you and you can listen and see the play and the pictures. When you read the textbook, you may not understand, but on the Internet you understand."

The teacher and her students considered the obstacles of using Internet texts in their classroom as a challenge for them, a challenge that could push them to higher reading levels and to develop independent learning ability and critical thinking skills. This attitude is crucial in order to successfully integrate Internet texts in classrooms. They perceived these challenges as a trial-and-error learning process. When reading Internet texts, students practiced various reading and text navigation strategies to tackle difficult texts with the guidance of their teacher. Textbooks and the Internet complimented each other well in this classroom. Furthermore, the teacher and students believed that the Internet provided updated content knowledge and that learning became interesting and effective.

Implications

From these findings, we can draw implications for intermediate teachers of all content areas who are interested in incorporating Internet texts to expand the reading opportunities of their students. Extensive professional training on computer technology is critical for effective integration of Internet texts in instruction. Appropriate attitudes are also very important. There is no doubt that both teachers and students will encounter a variety of challenges when using Internet texts, and it is critical for teachers to model a positive learning attitude and solve the challenges together with students.

While it is always necessary to scaffold students to meet the challenges of reading on the Internet, complimenting textbooks with the Internet is very effective. More importantly, Internet reading strategies and critical decision-making skills must be taught at schools. This study showed that most of these students did not have these necessary skills and strategies. Last, there are still other questions for researchers and educators to explore when studying the

use of Internet texts in classrooms. They include: how to deal with Internet texts with a variety of readability levels, how to better teach students to evaluate and analyze the online information and then synthesize the vast volume of information and communicate it to others, and how to more effectively teach Internet reading strategies and skills.

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**CELL PHONE USE AND EGO STRENGTH AMONG COLLEGE STUDENTS:
A PRELIMINARY STUDY**

Shari L. Willis

Rowan University

Glassboro, NJ 08028

ABSTRACT

As the number of cellular telephone users have increased exponentially around the world, individuals can and do remain in contact by texting or conversation with one another. The present study investigates the link between ego strength and the number of cellular phone minutes used for two consecutive months. The P.I.E.S. scale utilized Erikson's model of ego development through an individual's life span. This study found upper-class University students achieving ego stages on target with their ego development, but the research did not support relationship to monthly cell phone usage.

Introduction

Before cellular phone technology became commonplace landline telephone conversations were more in concentrated areas of homes or, if in public, were restricted to phone booths or telephone areas (Bergvik, 2004). Students are now able to use their phone anytime and anywhere. Although students try to text message inconspicuously, they can even be seen text messaging while at desks in college classes.

Cellular telephone users have evolved into a large population segment. Young and old alike are seen communicating with others through cell phone conversation and text messaging. For pre-adolescents through young adults cell phone usage has become a rite of passage. In the fall of 2007 approximately 93% of college students owned a cellular phone (Brandweek, 2007). The cellular phone allows college students to remain connected with family and friends from whom they may be living apart, and to remain connected to those in their campus environment. Cell phones are used in the school, at home during meals or study times, while operating a vehicle with or without friends, at the mall, in the lavatory, and at a restaurant. Since the Virginia Tech massacre on April 16, 2007 where 32 individuals were murdered many colleges and universities have developed a rapid response system where cell phones and computer users receive warnings.

Erikson describes eight sequential developing ego strengths for every person, which initially emerges in early childhood development, and continues throughout one's life span (Austrian,

2002). Erikson describes ego strength as qualities that "begin to animate man pervasively during successive stages of life" (Erikson, 1965, p.3). Erikson viewed the entirety of life and considered the developmental crisis that individual "must be dealt with for healthy development" (Austrian, 2002, p. 45). With the confrontation of each conflict, both inner and outer, an individual "emerges...with increased judgment, sense of self, and inner unity" (Austrian, 2002, p. 45). At the conclusion of each developmental stage a new strength and focus is attained. While the ego strength of "hope" begins in infancy, "will", "purpose", "competency", "fidelity", and "love" are viewed as achieving a resolution as one develops into a young adult. Only "care" and "wisdom" gain resolution in later periods of life.

The Psychological Inventory of Ego Strengths (PIES) developed by Markstrom et al. (1997) targeted to assess Erikson's theory and writings specifying the establishment and emergence of ego development in sequential steps beginning at birth. The P.I.E.S. has been shown to have validity and reliability when administered to college students (Markstrom & Marshal, 2007). Higher scores of ego strength of the P.I.E.S. "were positively correlated with psychosocial indicators of identity achievement, self-esteem, locus of control, empathic concern, perspective-taking, and positive forms of coping" (Markstrom & Marshal, 2007, p. 63). The first five ego strengths are stages with which university students could have completed, or are currently progressing to completion (Erikson & Erikson, 1997). The first stage of infancy focuses on hope versus withdrawal from the maternal or nurturing caregiver. The second stage of early childhood focuses on will versus compulsion. The third stage of play age focuses on purpose versus inhibition within the basic family. The fourth stage of school age focuses on individual competence versus inertia. The fifth stage of adolescence focuses on one's fidelity versus repudiation.

The purpose of the current study is to examine the cellular telephone use of college students and their relationship to the ego strengths of hope, will, purpose, competence and fidelity. The goals for this study are twofold: to test a theoretical paradigm, and to discern the applicability of the model in an ongoing national issue. Cell phones have given the consumer the ability to be in contact with others at all times. Yet being in contact with others has both positive and negatives aspects. Do college students who engage in excessive conversations or text messaging via their cell phones need assistance from friends or family members in making daily decisions? Individuals who encounter difficulty making daily decisions may feel uneasy when alone or may not initiate projects because of lack of self-confidence or self-direction.

Methods

After receiving Rowan University approval from the Institutional Review Board, the students from general education courses were requested to participate in the research study. Students were requested to complete a questionnaire and to provide two consecutive recent months of their personal cellular phone records. The questionnaire included demographic information and opinion questions regarding personal use of a cell phone. The P.I.E.S was included in the questionnaire. Since participants may have concerns regarding privacy of cell phone records

and numbers dialed all identifying information regarding participants' names and personal information were eliminated prior to submitting these records to the researcher.

The analysis of the materials provided by the participants included the P.I.E.S. questionnaire with items ranked on a likert scale from one to five. Each ego strength scale was comprised of eight questions that previously were shown to access specified ego strength. The sum score of each scale with a minimum of eight and a maximum of 40 was examined for the relationship between participants and the minutes used on the cell phone as well as the person called most frequently. The analysis of the cell phone records of each individual relating to the five ego strengths provided information regarding usage time and ego strength relationship.

Results

The study was comprised of 82 students from a four-year university. Data collected for this study was based on equal numbers of male and female undergraduate students, primarily from third and fourth year enrollees from Rowan University. The university is located in southern New Jersey and near Philadelphia.

Although cell phone plan information was requested many of the students were on family share plans and did not know the specifics of their plan. The mean number of minutes used was 789 with standard deviation of 89. Fifty-eight percent of the students claimed 11 or more cellular phone calls per day with 67 percent of usage being text messaging. When encountering a difficulty 55 percent of the students would personally consider their alternatives, and proceed with a desired course of action while 30 percent would dial a friend or family member.

If the student encountered a disagreement with another person, 54 percent would approach the person for resolution, compared to 29 percent who would contact a friend. While most students spend over 50 percent of their cell phone time interacting with their significant other, the secondary response would be to converse with a parent.

Based on the P.I.E.S. assessment of the 82 individuals in this study, each of the five scales of ego development or strength was related to the other four scales at the .01 level of confidence. This fact suggests the individuals achieved an appropriate level of ego development for their stage in life, and are in the process of negotiating the next stage of "love". Based on the scale of ego strengths, the subjects seem to have mastered the tasks defining ego development for the first five scales of P.I.E.S. Yet, these five ego strengths have negligible relationships with cell phone minutes using the Pearson Correlation. This perspective suggests that the sixth stage of ego development, love, should be incorporated for future studies. Perhaps the addition of love would have defined a gradient of ego development.

The equality of error variance across the five Ego scales was examined with Box's Test of Equality (Table 1), Bartlett's Test of Sphericity (Table 2), and Levine's Test of Equality of Error Variance (Table 3). Each of the three analyses did find an equality of variance across all five Ego

Strengths; therefore, the independent variable of cell phone minutes used per month provided similar equality of variances across the five ego strengths.

Table 1: Box's Test of Equality of Covariance Matrices

Box's M	120.962
F	1.245
df1	75
df2	3557.573
Sig.	.077

Table 2: Bartlett's Test of Sphericity

Likelihood Ratio	.000
Approx. Chi-Square	253.498
df	14
Sig.	.000

Table 3: Levene's Test of Equality of Error Variances

	F	df1	df2	Significance
Hope vs. Withdrawl	.878	7	73	.528
Will vs. Compulsion	.497	7	73	.834
Purpose vs. Inhibition	1.006	7	73	.434
Competence vs. Inertia	1.559	7	73	.161
Fidelity vs. Role Repudiation	1.111	7	73	.366

Discussion

According to Neuber and Genthner (1977) individuals high in ego identity or ego strength exhibit better interpersonal as well as intrapersonal compared to those that exhibit lower ego strength. They would appear as more resilient individuals, more targeted in their behavior with less moodiness or withdrawal from their milieu.

Table 4:

	<i>Hope vs. Withdrawal</i>	<i>Will vs. Compulsion</i>	<i>Purpose vs. Inhibition</i>	<i>Competence vs. Inertia</i>	<i>Fidelity vs. Role Repudiation</i>
Telephone Use Min Per Month	-.106	.093	.089	-.028	.145
Hope vs. Withdrawal		.680*	.719*	.729*	.695*
Will vs. Compulsion			.728*	.780*	.662*
Competence vs. Inertia				.749*	.684*
Fidelity vs. Role Repudiation					.651*

N=82 * Correlation is significant at the .01 level (2 tailed) using Pearson Correlation

Although the basic analysis demonstrated minimal relationships between minutes of cell phone usage and the five ego strengths, all of the ego strength scales were statistically related to each other at the .01 level of significance. Successful upper class university students may tend to possess ego strength above the collective society as these individuals must possess intelligence, perseverance and determination to progress through their college education.

Could the use exceeding two thousand minutes be considered an addiction for an individual? The Diagnostic and Statistical Manual of Mental Disorders-IV describes addiction as a potential symptom for an array of disorders. Addiction may be defined as a practice or habit unlikely to be abated without creating a trauma response. However, addiction is not considered a specific malady only a symptom. For the sample group the number of cell phone minutes per month ranged from 37 to 4579 with a mean of 789. As such, each student averaged 26 minutes per day, compared to 153 minutes daily for the top user. At what point would cell phone usage become a maladaptive behavior or an addiction, or a behavioral dysfunction? Future research should consider the possibility of the dysfunction.

Even though the data analyses did not specify or define maladaptive actions there may be several reasons and detriments to the health and behaviors of college students. The detriment to pedestrians has been studied, and it has been discovered that pedestrians may have an increased risk of accidents due to their attention being focused in different directions (Nasar, Hecht, Wener, 2008). In the current study 80 percent of the college students indicated that they use their personal cell phone while driving. There have been studies demonstrating the distraction potential of cell phone use while driving (Redelmeier & Tibshirani, 1997; Strayer, Crouch, & Drews, 2005), Strayer, Drews, and Johnson (2003) has clearly demonstrated that cell phone use while conducting a second activity, such as driving, reduces the ability to perform the

activity as well as the activity could or should have been performed. In his research Nelson (2007) reported that 100 percent of 267 university students who owned both an automobile and a cell phone had chatted on their cell phone while driving. Seventy two percent text messaged while behind the wheel.

Cellular technology has many benefits or advantages including calling emergency personnel or family members when assistance is deemed urgent. In our society many individuals carry their cell phones with them at all times of the day and night allowing others to keep in contact. College students need moments or periods of quiet time for study, reading, hygiene and rest. They need moments to reflect and critically process events of the day and to plan and prioritize future use of their time. How can this be achieved if an individual can always be communicating with another person while using a cell phone or other desired technologies?

According to Jenaro et al. (2006) an individual's increased cell phone use is related to experiencing higher anxiety, social dysfunction and increased insomnia. Cell phone use has been connected with the behavior of "staying up late at night engaged in exchanging messages, as well as emotional dependence reflected in the thought that users could not live without their cell phone" (Jenaro et al, 2006, p. 311). Although not directly related to one's personality, excessive cell phone use may reflect in the students' behaviors. Fields (2008) notes that alpha waves are the keystone of brain waves for sleep (p. 1) Cell phone use may increase an individual's alpha waves thus disrupting sleep patterns. In a study seeking the sleep effects of mobile phone signals, (Hung, 2007) described very low frequency pulse signals impacting on sleep. After the exposure from cell phone talking mode, sleep was delayed when contrasted with the listen only mode. Although cell phone transmissions may affect brainwaves and behavior the equivalent affect may be obtained from a half a cup of coffee (Fields, 2008). Surroundings and other factors also play a role in postponed sleep.

The foremost limitation to the present study is the results cannot be generalized to the general public. The focus of the study was strictly limited to college students at a four-year university. Ego strength and cell phone use may be related or connected in other sub groups of the population such as high school students. Although this was a preliminary and exploratory study the second limitation of the study was the small sample size and more upper classmen than lower classmen.

Future studies need to further address the implications of thought processes of individuals when they are constantly able to communicate with others via their cell phone. Could this lower the critical thinking processes as the individual does not need to introspectively reflect about events and personal actions taken. Future studies may also need to consider the personality associations for other groups such as adolescents and, even pre-teens, who are in constant use of their personal communication devices.

Another perspective might suggest that the college students' current level of ego development supports considerable confidence in their approach to their environment. They have elected

good choices, felt comfortable with themselves, and believe in a level of personal competence based on past success. As a group, the participants believe they make "good" choices. Knowing their past choices and basing their successful performance of future events on the successful performance of the past events, students feel as though they can continue such activities as driving and text messaging. Cell phones and other technological devices play a role in our lives and, thus, in the society as a whole. The implications of their use affect not only the user, but also others when their cellular phone use is in a public area or their inattention causes crashes or other types of accidents.

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**EFFECT OF EDUCATION QUALIFICATION IN INFORMATION TECHNOLOGY INDUSTRY:
A CASE STUDY OF INDIA**

Ranjana Agarwal

IMT Ghaziabad

Ghaziabad, India

ABSTRACT

The Information Technology industry is growing rapidly throughout the world. In India too, the IT sector has come to occupy a significant place in the Indian economy. Indian IT professionals have made their mark throughout the world. The IT sector is primarily a knowledge based sector, where knowledge is the main input. Hence education qualifications are expected to play a significant role in this sector and have significant impact on one's career mobility. How does education affect one's career patterns? This paper looks into these issues. Based on primary data collected from 2 cities in India, Delhi and Jamshedpur, the paper examines the effect of education on career movements in IT sector. A total of 252 respondents, consisting half of women, are surveyed. It is seen that education impacts career patterns in a significant way. It plays an important role at entry level. For women, education qualifications become more significant at entry level. Apart from education, women are also affected by lifecycle factors.

Introduction

The present day is the era of Information and Communication Technology. The Information and Communication Technologies have reduced the globe to a village. These technologies have created new opportunities for scientific progress, economic development, education and social change. The IT industry has gained the status of the fastest growing industry all over the world. In India too, the IT sector has come to occupy a prominent position. The Indian IT industry has been growing at a rate of more than 50 percent since 1991. The contribution of ICT is significant in terms of income and earnings, growth and employment generation (Nasscom, 2008). An abundant pool of skilled manpower has facilitated the rapid growth of IT industry in India. Hence, the IT workforce has come to occupy an important role in the economy. In India, the software and services exports are expected to cross \$40 billion, and the domestic market is expected to touch \$23 billion in 2008. The industry is estimated to achieve a target of \$73-75 billion in overall software and services revenues by 2010. The number of software professionals has been rising continuously over the years. The number of IT-BPO professionals employed in India grew from less than 200,000 people in 1998 to over 1.6 million in 2007 (Nasscom).

The Indian software industry has become the world's second largest pool of English speaking scientific manpower. There is demand for English speaking trained manpower in the IT sector. The IT sector is particularly suited to it. It is knowledge intensive, knowledge being embodied in

the people rather than capital intensive. Software production for export requires intensity of factor endowment in sophisticated skills. India has a comparative advantage in skilled intensive activities due to a long history of educational development at the tertiary level. Expansion of IT training facilities provided by two large IT companies led to a continuous supply of skilled manpower. Apart from this, efforts were made to utilize the available opportunities. The economic reforms of early nineties removed many of the bottlenecks and paved the way for harnessing the existing body of skilled manpower (World Employment Report, 1998-99).

There has been great demand for Indian IT workers in countries as USA, UK, Japan and Germany. Indian knowledge workers have been highly rated in India and abroad for their quality. Most employers rated Indians on an average of close to 9 on a 10 point rating scale (Nasscom). The presence of world class educational institutions as IITs helped India become a leader in software exports. They are the source of newly qualified graduates/post-graduates. India currently has around 347 institutes of higher education and 16,885 colleges with a total enrollment of over 9.9 million. These produce around 495,000 technical graduates, nearly 2.3 million other graduates and over 300,000 post-graduates every year. Formal education system is supplemented and complemented by thousands of private training institute in the country, which are providing computer education (Nasscom). An upcoming sector, the software segment is mainly concentrated in certain pockets in urban areas. IT companies are located mainly in cities as Bangalore, Poona and Chennai. Many computer firms are located in Delhi, Hyderabad and Mumbai.

Information technology refers to knowledge technology and techniques of knowledge production, processing and dissemination. Hence the information technology industry is referred to as 'knowledge industry' (Machlup, 1962). The information economy is considered as the domain of knowledge workers. This IT sector has two components, the IT-producing sector and the IT-using sector. The IT-producing sector primarily consists of products and services and is referred to as the core sector, whereas the IT-using sector is considered as the residual sector (Soete, 1987). IT-producing sector covers the manufacturing and services of IT-generating equipment and systems. It has led to the growth of demand for engineers and developers of IT hardware including computer manufacturing personnel, computer designers, R&D engineers, computer scientists and technologists.

The IT industry is thus a diversified field ranging from engineering, technical, development and educational software, and multimedia which is the output of work done by many knowledge workers. All IT related jobs demand that a person be highly skilled and have a certain minimum level of education and technical competence.

The growth of IT service related activities are employment intensive, providing job opportunities to those possessing the requisite skills for IT. There has been great demand in this sector for software workers as programmers, system analyst, and computer consultants (Freeman 1987). Software engineering deals with all activities designed to upgrade the software development process as an engineering discipline. They provide employment to a large number of highly skilled and specialized manpower.

Education qualifications are expected to play a significant role in the IT sector and have significant impact on one's career mobility. How does education affect one's career patterns? This paper looks into these issues. Based on primary data collected from 2 cities in India, Delhi and Jamshedpur, the paper examines the effect of education on career movements in IT sector. A total of 252 respondents, consisting half of women, in 10 different IT industries are surveyed. The main objectives of the paper are:

1. To find out the education background of IT employees.
2. It tries to find out the effect of education on career mobility patterns of men and women.
3. Third, the paper attempts to examine the education background of family members of IT professionals.

There is a brief survey of the existing literature, followed by data and methodology; operational definitions of term used. It is followed by analysis of the data and summary and conclusions.

Literature Survey

Education plays a significant role in job performance. The effect of education on job performance has been studied in detail. Individual performance on the job is affected by many factors. One factor that significantly affects individual performance and career movements, is 'human capital variable' (Spilerman, 1977; Sicherman, 1990; Sicherman & Galor, 1990). Human capital is one of the most important variables in determining one's productivity and /or one's perception of productivity (Rosenfeld, 1980; Sicherman & Galor, 1990). Acquisition of human capital is in form of education, continuity of experience and on- the- job training (Becker, 1975; Shultz, 1961; Mincer, 1974). In other words, the initial skill endowments at the level of job entry and the skill enrichment on the job decide the total human capital of the individual.

At the entry level, the productivity of an individual is judged by level of educational qualifications. Education acts as a signal to employers about the productivity of job applicants (Arrow, 1973; Spence, 1973). Education acts as a 'credential' or 'signal' to the employers. Employers feel that that education credentials are indicators of low training costs, as higher education levels lead to lower education costs. Hence, employers hire people with higher education levels. The quality of education, the area of specialization and the highest qualifications attained has a direct bearing on one's productivity. Thus, at the entry level, education plays a significant role in indicating one's productivity.

One's family background also has a direct bearing on an individual's productivity. The socioeconomic status of an individual is measured in terms of education, income and professional status of family members. The socioeconomic background of an individual interacts as human variables (Rosenfeld, 1980). Various studies show that effects of family background is mediated by education (Blau and Duncan, 1967; Duncan et al., 1972; Papanicolaou, 1974; Ruhm, 1987; Behrman and Taubman, 1989). Women are more motivated and socialized to perform well in their jobs in families with a higher socioeconomic status (Jaiswal, 1993). Also, it is seen

that children of families with a high socioeconomic status have better chances of entering well-paid jobs (Krishnakumar, 1987; Chitnis, 1987).

Various factors affect human capital accumulated on the job. A factor that significantly affects human capital accumulation is work experience or tenure. Education makes a person more productive with skills acquired during training. Hence, skill formation is an important component of human capital formation (Becker, 1975; Shultz, 1961; Mincer, 1974; Rosen, 1972; Khadria, 1984). The labor market plays an important role in the transmission and acquisition of skills (Rosen, 1972). A break in work experience leads to depreciation of skills. The more experienced a person and the greater the number of hours spent in the workplace, the higher are the levels of human capital accumulated. The age of entry is also crucial in determining one's upward mobility (Spilerman, 1977).

Investment in on- the-job training also has a direct bearing on one's productivity. The greater the training, the more one has chances of upward mobility. Training actually received is rewarded equally, irrespective of race or sex (Duncan & Hoffman 1974). Hence, more the opportunities provided for on-the-job training, the greater the amount of human capital accumulated. It is seen that differences in employment outcomes may be due to unequal access to opportunities for accumulating human capital (Duncan & Hoffman 1974, Olson & Becker 1983). Women have less of education, training and work experience and they have less of human capital. They may be considered to be less productive than men (Mincer and Polachek, 1974).

Very few micro level studies have been conducted regarding Education employment Linkages. Studies by Jayanthi and Madhavan (1985), TCS (1991), IAMR(1997), STEM (1999) highlight employment patterns in IT industry. They however deal with particular issues dealing in a specific firm. There is a gap in literature regarding education unemployment linkages. This research paper highlights education employment linkages in 10 different firms in India.

Methodology

This study is an empirical study. The information for the study has been collected from primary sources. There is a random sample of 252 respondents working in 10 different IT companies in Jamshedpur and Delhi in April-May 1999. The total sample consists of 125 females and 127 males. The information regarding the respondents was collected by interviewing them personally by using a pretested questionnaire.

Operational Definitions of the Study and Data Analysis

Career mobility: For this study, career movements are measured in terms of time taken to move from one rank to another. Increase in salary and change in job rank are indicators of career mobility. However, it was not possible to get data on salary, as many companies do not allow employees to reveal their salary. Also, some employees were skeptical about revealing their salary. Hence, increase in job rank was taken as an indicator of career mobility. On the basis of

actual time required to move from one rank to another via the expected time for a change in job rank, employees are classified as slow, normal and fast. Job rank or job status is measured in terms of job ranking in the organizational hierarchy. In a firm, an employee may be promoted to higher grades in terms of organizational structure. Also, employees may shift from one organization to another, which they may consider better in terms of career opportunities.

Nature of job: The work structure in the IT sector has been categorized into five levels of functions. The five categories of jobs are 1. Programmer (coding/testing), 2. Project Coordinator (Designer), 3. Project leader (Analysis), 4. Project Manager (Project Management) 5. Consultant/group head.

Education: The educational qualifications are measured in terms of the highest qualifications acquired by an individual, either from the formal or non formal sector of computer education

Training: Is measured in terms of number of training programs attended. It may refer to training programs conducted outside the firm as well as on-the-job training provided in the firm itself.

Survey Results

- *Firm of Employment*

The respondents are working in 10 different companies – TCS, NIIT, Compunnel, IDC, Cyber Media, Modi Xerox, HCL Tech. Ltd., TISCO, TTIL, Tata Timken as shown in Table 1. The first seven companies are located in Delhi while the remaining three are located in Jamshedpur. It is seen in table 1 that of the total sample, the single largest group is working at NIIT - 27 percent, followed by TCS - 18 percent. 14 percent respondents are employed in TISCO i.e., these four companies constitute 70 percent of respondents which is more than half the sample. Modi Xerox has 12 percent of respondents whereas 8 percent are in Compunnel, 9 percent in Cyber Group, 4 percent in HCL Technology, 7 percent in TTIL and 1 percent in Tata Timken.

Table 1: Firm of Employment

Company	Total	Male	Female
TCS	18.3	19.7	16.8
NIIT	26.6	23.6	29.6
Compunnel	8.3	7.9	8.8
IDC	2.4	2.4	2.4
Cybermedia	6.3	6.3	6.4
HCL Tech	4.4	3.9	4.8
ModiXerox	11.9	14.2	9.6
TISCO	13.5	11.8	15.2
TTIL	7.1	8.7	5.6
TataTimken	1.2	1.6	.8
Total	100	100	100

Source: Field Survey

- *Socio-economic Status of Respondents*

Caste and religion

The database consists of 252 respondents, consisting of 125 women and 127 men as shown in Table 2a. 51 percent of the respondents are men while 49 percent of them are women. Of the total sample, 228 are Hindus, 5 Muslims, 4 Christians and 15 Sikhs (i.e., 91 percent of the sample are Hindus, 2 percent Muslims, 2 percent Christians and 6 percent Sikhs as shown in Table 2a). Out of 252 respondents, 251 respondents belong to the OBC category (i.e., 99.6 percent respondents belong to the general category). All respondents belong to the urban regions. Thus, it is seen that majority of respondents entering the IT industry belong to the upper caste and urban areas who had access to higher education related to newer technologies.

Table 2a: The Respondents (in percentages)

	Total	Hindus	Muslims	Christians	Sikhs
Total	100	90.5	1.9	1.6	5.9
Male	100	90.5	2.4	1.6	5.5
Female	100	90.4	1.6	1.6	6.4
	Total	SC	ST	OBC	General
Total	100	0	00	.4	99.6
Male	100	0	0	0	100
Female	100	0	0	.8	100

Source: Field Survey

Age

IT is a newly emerging industry and the respondents all belong to the younger age groups. The average age of respondents is around 29 years. The average age of men is 30 years whereas it is 28 years for women. It is seen that 74 percent of the total respondents are less than 30 years of age (Table 2b). 77 percent of women are less than 30 years as compared to 70 percent men. 47 percent of men belong to 25-30 years age group. The maximum number of women, 56 percent are in 25-30 years age group. The IT industry is limited to only certain sections of the population who have entered this industry at a relatively young age.

Table 2b: Age of Respondents (in percentages)

Age groups	20-25	26-30	31-35	36-40	41-45	46-50	Total
Total	21.6	56	16	4	2.4		100
Male	22.8	47.2	17.3	4.7	4.7	3.1	100
Female	22.2	52	16.7	4.4	3.6	1.6	100

Source: Field Survey

Marital Status

The respondents belong to the younger age groups and a large number of respondents are single. Out of the total respondents, 54 percent of the respondents are married, 46 percent are unmarried, 0.4 percent widowed and 0.4 percent divorcees (Table 3). 53 percent of women and 54 percent of men are married. The average age of marriage was 27 years for males and 23 for females.

Table 3: Marital Status of Respondents and Type of Family (in percentages)

	Total	Unmarried	Married	Divorced	Widow
Total	100	45.6	53.8	.4	.4
Male	100	45.7	54.3	0	0
Female	100	44	54.4	.8	.8

Source: Field Survey

- *Educational Qualifications*

Education Background

The levels of education required to enter the IT field is measured in terms of formal degree or a diploma in computers. As there is a demand for English speaking trained manpower in the IT sector, the medium of instruction plays an important role in job entry. Professionals entering this field have studied mainly in private schools have specialized education in this and have had adequate pre-service training. The academic performance is also examined. The data reveals that the majority of computer professionals are products of English medium schools (Table 4). 79 percent of respondents, 94 percent women and 64 percent men have studied in English medium schools. 72 percent of respondents have studied in private schools. 80 percent women have studied in private schools as compared to 64 percent men. This sector comprise mainly professional with an elite background products of private English medium schools. Entry is restricted to certain groups of people. Majority of women entering this sector belong to families

who have adequate resources and give equal opportunity to daughters regarding educational opportunities.

Table 4: Educational Background (In percentage)

	Total	Female	Male
Schooling			
English Medium	78.8	93.6	64
Private School	71.8	80	64.4
Degrees			
Specialisation related to work	82	84	81.1
Passed in 1st division	88	87.2	89
Undertaken preservice training	43.3	41	45

Source: Field Survey

Educational Qualifications

The respondents have different educational qualifications as shown in Table 5. More than half of the respondents have professional degrees. It is seen that 51 percent of men have qualifications like engineering, MCA, MBA, etc. compared to 44 percent of women (Figures 1a and 1b). 9 percent of men have a masters degree in engineering and a doctorate in general fields as compared to 6 percent of women. 13 percent of men are diploma holders as compared to 22 percent of women. 20 percent of men have M.Sc. Degree as compared to 26 percent of women. The highest qualification is that of a doctorate degree held by 2 percent men in engineering field. It is seen that respondents entering a new field as IT have high levels of education and skills.

Table 5: Educational Qualifications (In percentages)

	Total	Female	Male
Diploma in Engineering, Electronics	8.7	12.0	5.5
Computer diploma	9.5	11.2	7.9
M.Sc. and others	23.4	26.4	20.5
M.Phil.	2.0	0.8	3.1
Engineer, MBA, MCA, MFA	47.6	44	51.2
Masters in Engn. And Ph.D. in others	7.5	5.6	9.4
Ph.D. in engineering	1.2		2.4
Total	100	100	100

Source: Field Survey

Figure 1a: Educational Profile of Men

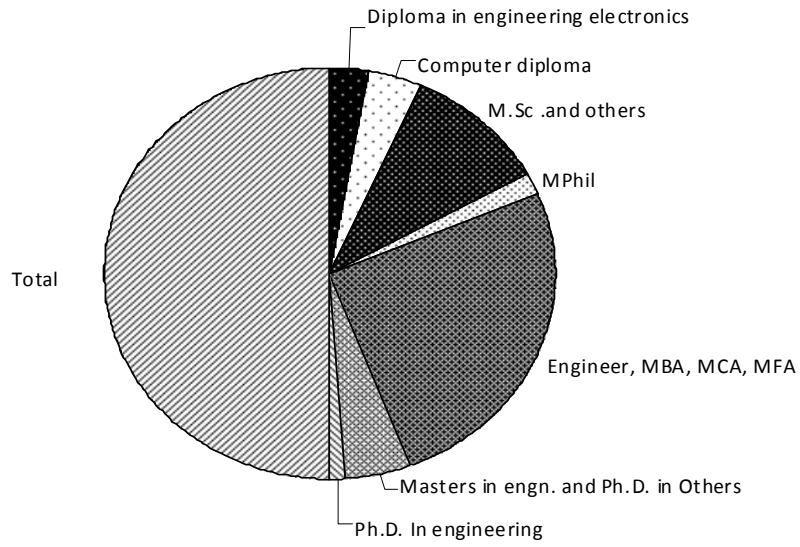
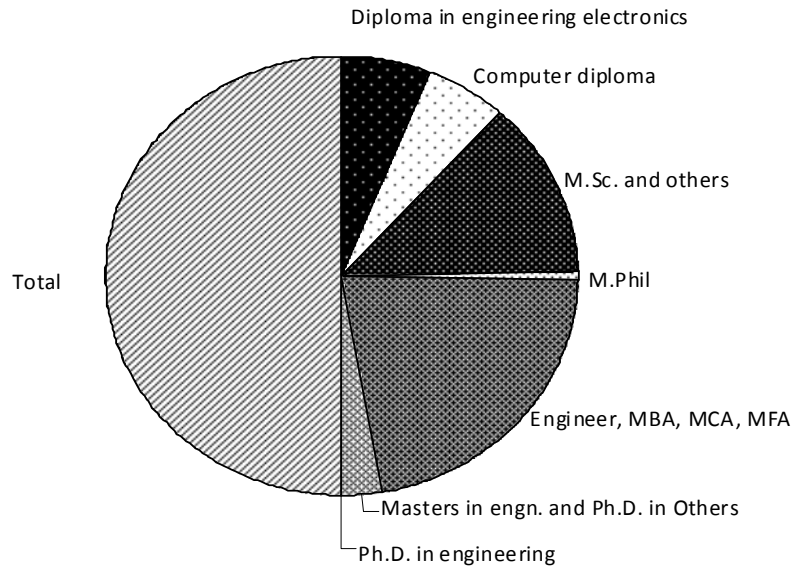


Figure 1b: Educational Profile of Women



- *Entry in labor market*

IT is an upcoming field and there is great demand for professionals in this sector. Many companies recruit professionals directly from educational institutes. On examining the patterns of recruitment, it is seen that majority of people are recruited through campus interviews and through advertisement. Campus interviews were the main source of recruitment. 40 percent of respondents were recruited through campus interviews, whereas 33 percent were selected through advertisement (Table 6). However, 43 percent of men were recruited through campus interviews, as compared to 38 percent women. It is also seen that 58 percent of women and 52 percent of men have been recruited as trainees. The respondents have had access to education facilities related to this sector earlier, hence they had a direct entry to this industry. The patterns of recruitment show that IT industry has its own entry criterion and selectively chooses its entrants. There is selective entry process when the industry regulates its entrants and puts them on the job.

Table 6: Recruitment Patterns in first Job (in percentages)

Method of Recruitment	Total	Female	Male
Campus Interview	40.1	43.3	37.6
Advertisement	32.9	31.5	33.6
Employee Ward quota	1.6	0	3.2
Family connections	2.4	42.4	2.4
Friends	4	3.1	4.8
Other sources	19	19.7	18.4
Total	100	100	100
Recruited as trainees	55.6	52	58.4

Source: Field Survey

- *Career Patterns*

Tenure of service

The IT industry is a relatively new industry and the respondents are mainly in the younger age groups. The average of entry into the labor market is 22-23 years. As the respondents are mainly belong to the younger age groups, the average experience of the respondents is very less. On examining the tenure of service of respondents, it is seen that 33 percent of respondents have experience up to 3 years. 38 percent of respondents have 3-6 yrs experience, i.e., 70 percent of respondents have experience less than 6 years (Table 7, Figure 2). 80 percent of women have

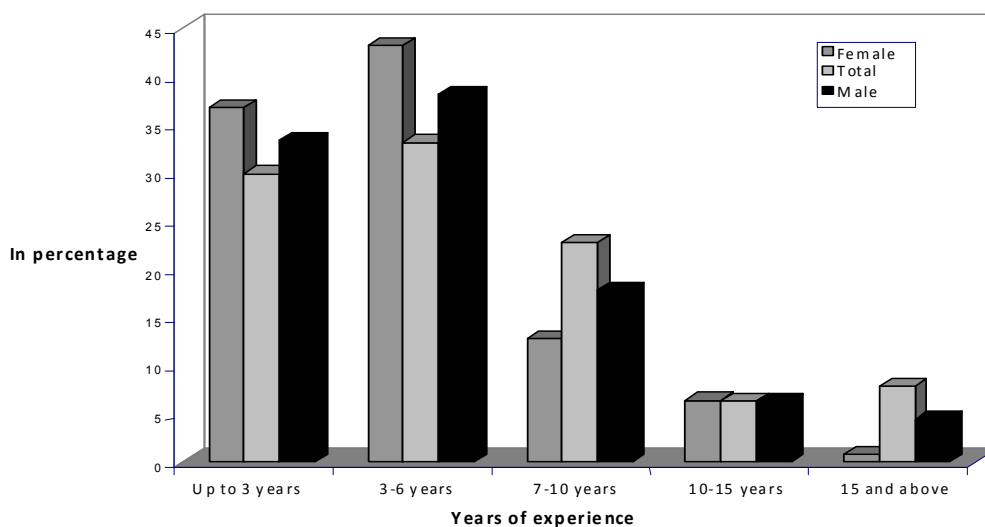
experience below 6 years. This industry is a recent phenomenon and women have started entering this field recently in India. Only 7 percent of women have more than 10 years experience. It is seen that men have a longer tenure of service as compared to women. For women, the average tenure of work experience is 5 years whereas it is 6 years for men.

Table 7: Tenure of Service (as stated columnwise)

In Years	In Numbers			In Percentages		
	Female	Male	Total	Female	Male	Total
Up to 3yrs	46	38	84	36.8	29.9	33.3
3-6 yrs	54	42	96	43.2	33.1	38.1
7 - 10 yrs	16	29	45	12.8	22.8	17.9
10 - 15 yrs	8	8	16	6.4	6.3	6.3
15 and above	1	10	11	0.8	7.9	4.4
Total	125	127	252	100	100	100

Source: Field Survey

Figure 2: Work Experience



Gradewise Location in the Organizational Hierarchy

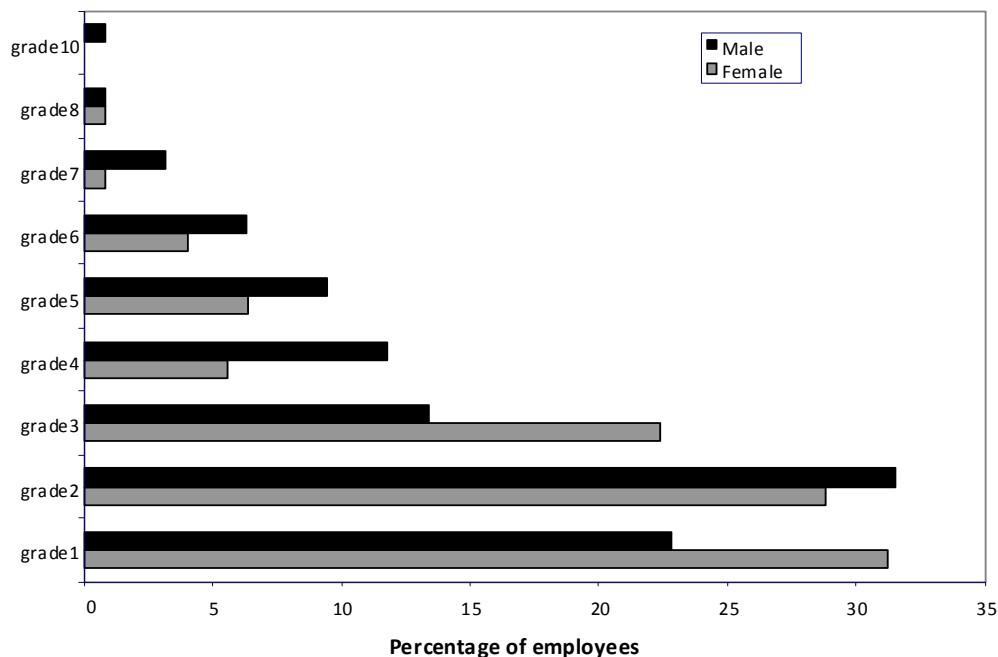
On examining the location of respondents in an organization, it is seen that more men are located at higher levels of the organizational hierarchy. It is seen that 27 percent of respondents are located in grade 1 and 30 percent respondents are on grade 2 (Table 8, Figure 3). 34 percent of respondents are on grade 3, 4 and 5. Only 8 percent of respondents are above grade 5. The proportion of women decreases at higher grades. Fewer women have reached higher grades when compared to men. 82 percent of women are located on grades 1, 2 and 3 as compared to 68 percent of men.

Table 8: Gradewise Distribution of Employees (from top to bottom)

Grades	In Numbers			Percentages		
	Female	Male	Total	Female	Male	Total
10		1	1		0.8	0.4
8	1	1	2	0.8	0.8	0.8
7	1	4	5	0.8	3.1	2.0
6	5	8	13	4	6.3	5.2
5	8	12	20	6.4	9.4	7.9
4	7	15	22	5.6	11.8	8.7
3	28	17	45	22.4	13.4	17.9
2	36	40	76	28.8	31.5	30.2
1	39	29	68	31.2	22.8	27.0
Total	125	127	252	100	100	100

Source: Field Survey

Figure 3: Gradewise Location of Employees



Patterns of Career Movements

The locations/grade in the organizations are examined in relation to tenure of service. The requisite time required to reach a grade, is compared to the actual time taken to reach the current grade at which the respondent is located presently (The time required to reach a grade depending on the promotion policy of the company and thus varies from company to company). It is found that some people have reached the current grades in less than the stipulated time. Some people reached their current grades in the normal time frame whereas, some people have taken more than required time to reach their current posts. Thus, it is seen that some people have moved quickly and some are moving at a normal pace as desired. On the other hand, some people are moving slowly. Thus on the basis of grades attained and tenure of service, career patterns may be classified into different rates of career mobility – slow, normal and fast. Some respondents are fresh recruits and are classified as new.

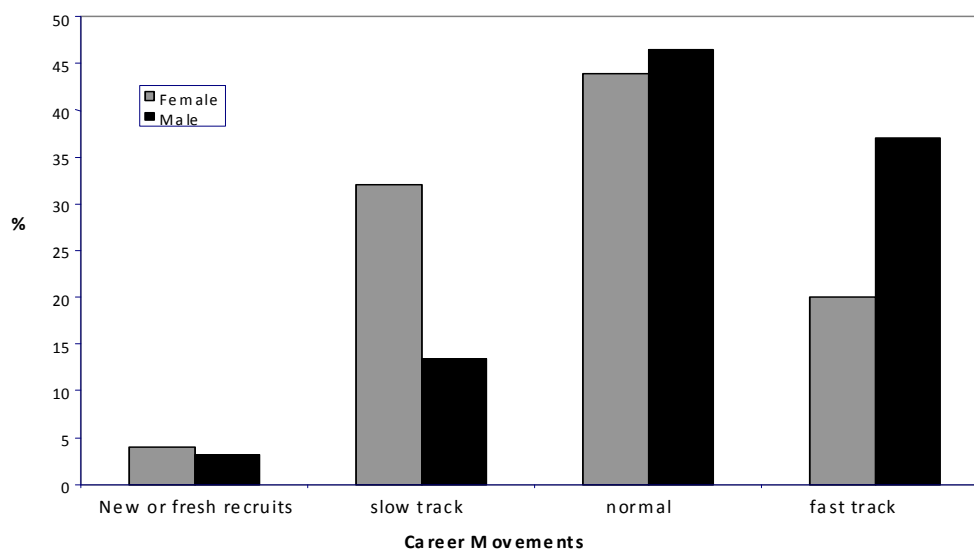
It is seen that patterns of career movements vary significantly among men and women (Figure 4). As seen in Table 9, it is found that 45 percent of total respondents are on normal track, 29 percent are on fast track and 23 percent are on slow track. A noteworthy feature is that 32 percent women are on slow track as compared to 13 percent men. 37 percent of men are on fast track as compared to 20 percent of women.

Table 9: Patterns of Career Movements (as stated columnwise)

Career Movement	In Numbers			Percentages		
	Female	Male	Total	Female	Male	Total
New or fresh recruits	5	4	9	4	3.1	3.6
Slow track	40	17	57	32	13.4	22.6
Normal	55	59	114	44	46.5	45.2
Fast track	25	47	72	20	37.0	28.6
Total	125	127	252	100	100	100

Source: Field Survey

Figure 4: Career Movements of Respondents



- *Effect of human capital endowments on career mobility:*

Educational qualifications

They play a significant role in affecting one’s career mobility. The criterion for entry in the IT industry is a formal degree or a diploma in computers. However, it is seen that although these levels are considered comparable at entry point, there are significant differences in the performance levels of varying groups. IT is a newly growing sector and there is paucity of skilled labor in terms of formal degreeholders. The industry is gearing to meet its requirements by employing a wide range of IT trained personnel who have different levels of IT skills. However, it is seen that although the group of diploma holders is considered to be at par with trained professionals at entry level, the post labor market situation are very different. Top jobs are out

of reach for diploma holders. It is seen that respondents who have higher education levels are on the faster track as shown in Table 10. Education advantages workers in the IT industry who have higher levels of qualifications. It is seen that people who have professional degrees like B.Tech., MBA, MCA are more on fast track, i.e., 61 percent respondents of fast track group are engineers as compared to 27 percent of slow track. All persons with a doctorate degree in engineering are on normal or fast track. 18 percent of slow track respondents have computer diplomas compared to 7 percent of fast track, whereas 33 percent of slow track people have MSc and others as compared to 14 percent of fast track respondents.

Table 10: Educational Qualifications & Career Movements (in percentages as stated columnwise)

	New	Slow	Normal	Fast	Total
Diploma in engineering , electronics	33.3	12.3	7.9	4.2	8.7
Computer diploma	11.1	17.5	7.0	6.9	9.5
M.Sc and others	33.3	33.3	23.7	13.9	23.4
M.Phil		3.5	0.9	2.8	2.0
B.Tech, MBA, MCA,MFA	11.1	26.3	52.6	61.1	47.6
Masters in Engn. and Ph.D. in others	11.1	7.0	7.0	8.3	7.5
Ph.D. in engineering			0.9	2.8	1.2
Total	100	100	100	100	100

Source: Field Survey

The chi-square test is used to test the homogeneity of different groups in terms of educational qualifications and career performance in the IT industry. It was found that the calculated $\chi^2 = 60.93$ is highly significant, the table χ^2 value being 13.08 at .01 level of significance. This indicated that in 99 percent of cases, there is probability of occurrence of heterogeneity between different educational groups and career performance. It was thus concluded that career performance is not independent of educational levels of respondents in the IT industry.

Apart from formal educational degrees, other educational characteristics also affect career mobility as shown in Table 11. It is seen that pre-service training, schooling, area of specialization also affects one's career mobility. Pre-service training also has an impact on one's career mobility. It gives a starting edge to one's careers. 50 percent of fast track and 49 percent of normal track have had pre-service training as compared to 32 percent of slow track people. The majority of computer professionals, i.e., 84 percent of respondents are products of English medium schools. 85 percent of fast track, 85 percent of normal and 80 percent of slow track

respondents have studied in English medium schools. Of the total respondents, 75 percent persons have studied in private schools. It is seen that 72 percent of fast track respondents have studied in private schools as compared to 68 percent of slow track. It is also seen that the majority of respondents has excelled academically and has passed in first division. Around 94 percent of respondents, 94 percent of fast track and 89 percent of slow track persons have passed in first division. For 83 percent of the respondents, the area of specialization is related to their work. This may have a slight effect on one's career as it is seen that 82 percent of fast track and 89 percent of normal track have specialization related to their present work as compared to only 74 percent of respondents on the slow track. It is observed that educational background of an individual has a significant impact on career mobility.

Table 11: Other Educational Characteristics (in percentage, as stated column wise)

	New	Slow	Normal	Fast	Total
Had Pre-service training	44.6	31.5	48.6	50	45
Studied in English medium school		88.9	80.4	84.8	85.3
Specialization related to work	88.9	73.7	88.5	81.7	83.2
Products of private school	55.6	67.9	81.1	71.6	74.5
Passed in 1st division	88.9	88.9	95.3	94.1	93.3

Source: Field Survey

Managerial and Administrative responsibilities

Career mobility is directly influenced by administrative and managerial responsibilities and official trips. It is seen that education levels are significantly linked to nature of duties and responsibilities allotted on the job.

Education qualifications are significantly linked to outstation tours as it is seen that those who are traveling very frequently have higher levels of education. As seen in Table 12 (source: field survey), among people who travel very frequently, 85% have professional qualifications. Among the group with professional qualifications, 60% have managerial and administrative responsibilities and have joined as trainees. The job roles allotted at the workplace also depends upon levels of education as it is seen that the higher educated group have higher levels of duties and functions. Thus, it is seen that education levels are invariably linked to nature of job and opportunities provided at the workplace. Thus, groups with different educational qualifications have differential rates of career movements.

Table 12: Education Linkages (in percentage, as stated column wise)

Educational Qualifications and In-service Training					
	None	Rarely	Regular	Total	
Diplomas	15.00	17.44	18.42	18.25	
MSc,Mphil	33.75	24.42	21.05	25.40	
Btech etc.	51.25	58.14	60.53	56.35	
Total	100	100	100	100	

Educational Qualifications and Responsibilities and Trainees					
	Administrative	Managerial	Joined as Trainee		
Diploma	15.89	17.50	14.29		
MSc,MPhil	21.50	23.13	25.00		
Btech etc.	62.62	59.38	60.71		
Total	100.00	100	100		

Educational Qualifications and Frequency of Outstation Trips						
	None	Rarely	Frequently	Very frequent	Total	
Diploma	23.30	17.92	9.09	0.00	18.47	
MSc,MPhil	33.01	19.81	24.24	14.29	25.70	
Btech etc.	43.69	62.26	66.67	85.71	55.82	
Total	100.00	100.00	100.00	100.00	100.00	

Educational Qualifications and Job Role							
	Programmer	Project Coordinator	Project Leader	Project Manager	Head	Total	
Diploma	21.82	29.55	8.62	17.95			
MSc,MPhil	30.91	34.09	24.14	23.08	16.67	27.72	
Btech etc.	47.27	36.36	67.24	58.97	83.33	53.96	
Total	100	100	100	100	100	100	

Human capital in terms of Parents' Education level and Professional Status

Human capital in terms of family background has an effect on one's career mobility. Parents' education levels affect career prospects. Women fare better who have a better socioeconomic status, because educationally and economically well off families provide an atmosphere where women are motivated and socialized to undertake future occupational roles. Table 13 (source: field survey) shows the parental background of the respondents.

It is seen that majority of respondents entering professions as IT have a high socioeconomic status. 90 percent of respondents have fathers who have graduation and above levels of education. 39 percent of respondents have fathers who have professional qualifications, 15 percent have fathers with postgraduate degrees and 7 percent have a doctorate degree. It is seen that 56 percent of women are children of doctorate/professional fathers as compared to 36 percent of men. It is also observed that women who enter a new area as IT, have fathers who have higher education levels as compared to men. It is also seen that 88 percent of respondents have fathers who are in service. 63 percent are in professions as medicine/law/engineering. 10 percent of respondents are children of businessmen whereas 3 percent are children of farmers. 87 percent of women are children of service/professionals as compared to 88 percent of men (i.e. almost a similar number).

It is also seen that women's mother's education levels are much higher than men. For 70 percent of respondents, mother's education level is more than graduation. 75 percent of women have mother whose qualification is graduation level and above as compared to only 62 percent of men. 31 percent of men have mothers who have studied up to Class X. Also, more women are children of postgraduate mothers as compared to 17 percent of men. Henceforth, women have mothers with higher educational levels, their professional attainment is also higher as compared to men. 74 percent of population have mothers who are housewives. 83 percent of men have mothers who are housewives, as compared to 66 percent women. 14 percent of women have mothers who are college teachers/professionals as compared to 7 percent of men. Thus, it is seen that majority of women entering a knowledge based field as IT all come from families with a high socioeconomic index.

Table 13: Parental Background (In percentage as measured columnwise)

Father's Education	Women	Men	Total
Below graduate/diploma	5.5	14.4	9.8
Graduate	28.2	31.7	29.9
Postgraduate	10.9	18.3	14.5
Doctorate	8.2	4.8	6.5
Professional	47.3	30.8	39.3
Total	100.0	100.0	100.0

Father's Profession	Women	Men	Total
Farmer	0.9	4.7	2.8
Self business	11.8	7.5	9.7
Service	25.5	23.6	24.5
Medicine/engineering	61.8	64.2	63.0
Total	100	100	100

Mother's Education	Women	Men	Total
Up to class 10	14.7	30.8	22.7
Class 12	10.3	7.7	9.0
Graduate	47.4	41.9	44.6
Post graduate	25.0	17.1	21.0
Doctorate	2.6	1.7	2.1
Professional	0	0.9	0.4
Total	100	100	100

Mother's Profession	Women	Men	Total
Housewife	65.5	83.1	74.4
School Teacher	20.7	10.2	15.4
College Teacher	2.6	3.4	3.0
Professional	11.2	3.4	7.3
Total	100.0	100.0	100.0

Human capital in terms of Spouse' Education and Professional Status

The educational and professional status of one's spouse also determines socioeconomic status. 53 percent of women and 54 percent of men are married, i.e., 53 percent of respondents are married. Table 14 shows the educational and professional status of spouses. 51 percent of married respondents have spouses with a professional degree, 41 percent are graduates/post graduates and only 9 percent have spouses with educational levels below graduation. However, the education levels differ significantly among spouses' men and women. For 77 percent of women, the spouse has professional education whereas only 25 percent of men have spouses with a professional degree. Spouses of women have higher education levels in comparison to men.

Table 14: Spouse's Background (in percentage, as stated column wise)

Spouse's Education	Women	Men	Total
Below graduate	1.6	15.6	8.6
Graduate & post graduate	21.9	59.4	40.6
Professional	76.6	25.0	50.8
Total	100.0	100.0	100.0

Spouse's Profession	Women	Men	Total
Housewife	0.0	53.1	26.6
Others	40.6	21.9	31.3
Business	1.6	4.7	3.1
Professional	40.6	17.2	28.9
Software	17.2	3.1	10.2
Total	100.0	100.0	100.0

On comparing professional status of the spouse, it is seen that it varies considerably among men and women. Due to allocation of gender roles in society, the professional status of men and women vary significantly. Among married respondents, 58 percent of women have husbands in service/professions as law/engineering/medicine etc. and software as compared to 20 percent of men. 53 percent of men have spouses who are housewives. It is thus observed that socioeconomic status of women as measured in terms of human capital, is higher in terms of parents' and spouse' educational and occupational attainment.

Summary and Conclusions

It is observed that the respondents working in IT industry have high levels of skills. More than half the respondents have a formal degree related to computer education. It is seen that 38 percent of the respondents have entered the labor market through campus interviews. Also, it is observed that men and women have similar educational qualifications and have entered the labor market through the same entry modes. Men and women are thus comparable in terms of human capital at entry levels in the job market. Educational qualifications are significant in career movements in the IT sector. Education affects an individual's careers in many ways more than one. Also it is seen that respondents who are moving on the fast track have higher levels of education. Education thus becomes one of the most important factors in determining career movements in the Information Technology sector. It is seen that although the group of diploma holders is considered to be at par with trained professionals at entry level, the post labor market entry situation are very different. The career patterns of diploma holders are different career as compared to respondents with formal degree holders.

High education levels lead to higher responsibilities and job roles; hence one has greater opportunities to accumulate human capital. It is significant in determining opportunities at the workplace. Respondents with higher education levels are located in jobs which offer them more scope to show their creativity and ability. Hence, they have faster career movements. It is also seen that parents education level one's career mobility in IT sector. Respondents in IT sector have parents with high education levels. Various factors thus combined with education influence one's career movements.

The author is grateful to Prof. Binod Khadria, Professor of Economics, ZHCES, SSS, JNU New Delhi, for providing valuable suggestions in the course of preparation of this paper.

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