FACTORS IMPACTING ADULT LEARNER ACHIEVEMENT IN A TECHNOLOGY CERTIFICATE PROGRAM ON COMPUTER NETWORKS

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ABSTRACT
This study investigates the factors impacting the achievement of adult learners in a technology certificate program on computer networks. We studied 2442 participants in 256 institutions. The participants were older than age 18 and were enrolled in the Cisco Certified Network Associate (CCNA) technology training program as 'non-degree' or 'certificate' students. Using a multilevel analysis, factors impacting adult learners' achievement were identified. The results of Hierarchical Liner Model (HLM) analysis demonstrated that work status, degree orientation, motivation, age, gender, and computer technical ability of the participants at the beginning of the program had impact on adult learner achievement. On the contrary to the past research, the analysis showed that adult learners with full-time jobs achieve more than adult learners with no full-time jobs. Additionally, the institutional level factors did not have any impact on achievement. Findings of this study provide important information for developing a framework that can guide research and practice in technology certificate programs.
Keywords: Adult learning; lifelong learning; distributed learning environments

INTRODUCTION

Technology certificate programs provide inexpensive and concentrated venue both for learners who wish to develop new skills and for working professionals who wish to upgrade their skills. Available technology certificate programs in the United States are populated primarily by adult learners (Meares & Sargent, 2003). The majority of these certification programs utilize performance-based evaluation systems to measure student achievement in which students must attain a certain level of competency (Adelman, 2000). We examined selected participant level and institutional level factors impacting the achievement of adult learners in the Cisco Certified Network Associate (CCNA) program. The program consists of four separate courses taken in sequence and accepts participants from all ages and backgrounds and is offered through high schools, colleges, universities, and non-traditional educational settings.

There are four key components to the Cisco Networking Academy environment: 1) a centralized curriculum distributed over the Internet; 2) standards-based testing distributed over the Internet; 3) locally managed and designed instruction; and 4) a system for ongoing training, support, and certification of instructors. These types of learning environments where different media are integrated into classroom instruction are referred as "hybrid

instruction" or "blended learning" (Delialioglu & Yildirim, 2007). The idea behind integrating these types of learning environments is to maximize the strengths of both face-to-face and online modes of instruction.
All curriculum materials are distributed via the Internet. Based on task analyses of what computer network engineers need to know to work effectively in organizations, the curriculum is updated on a regular basis. Instructors and participants may access materials from any computer with a Web browser using a proprietary course management system. The curriculum includes online interactive learning materials, as well as a series of lab exercises to be conducted in a laboratory with networking equipment.

The Cisco Networking Academy has a hierarchical organizational structure. At the top of this hierarchy, there are Cisco Academy Training Centers (CATCs) managing 5-50 Regional Training Centers (RTCs). RTCs reside at the second level. Each RTC offers classes to participants and manages 10-50 Local Academies (LAs). There are approximately 625 RTCs and 4500 LAs in the U.S. Cisco works directly only with the CATCs, leaving them to work with the RTCs to train the LAs to implement the program.

Learner Achievement in Technology Certificate Programs
The focus of this study is on the factors impacting achievement of adult learners in a technology certificate program that provides the four key features: centralized curriculum, standards-based testing, local implementation, and instructional support. Current literature suggests that three sets of characteristics affect student achievement: participant characteristics, curriculum characteristics, and institutional characteristics (Lee, 2000; Walberg, 1984). Because the CCNA program utilizes a standardized curriculum and standardized testing, curriculum characteristics were omitted from analysis, therefore, this study focuses on participant and institutional characteristics that may have impact on learner achievement in technology certificate programs.

Participant level factors
Three classes of participant level variables were examined in this study: demographics, computer skills, and motivation. Participant demographics are important to collect and analyze to understand the differences between student groups (Schreiber, 2002). Especially in computer related technology courses, males typically have a greater ability and interest in the content than do females (Crombie & Abarbanel, 2000; Green, 2000).

Two demographic factors are age and job status. Age is an important factor that may influence an adult learner's achievement. Due to cognitive development and the amount of academic and life experience at different ages (Justice & Dornan, 2001), older learners are expected to perform better than younger learners. A participant's employment status might be also expected to influence their achievement in technology certificate programs. At the college level, prior research suggests that students with full-time jobs academically achieve less than students with a part-time job or no job (King & Bannon, 2002; Paul, 1982).

Computer skills, the second participant level factor, are important abilities that could enable participants to learn more effectively in computer courses. The more general knowledge of computers that the participants of the program have, the more likely they will be able to master the new networking knowledge (Cashion & Palmieri, 2002; Kennedy, 2000; Thompson & McGrath, 1999).

Motivation is the third set of participant level factors that were considered. An individual's beliefs, goals, and expectations are directly related to being engaged or disengaged in learning. Many studies have linked motivation and engagement to individual achievement (Eccles & Wigfield, 2002). Individuals who place a greater value on learning the material and have greater expectancy to be successful in a course are more likely to achieve at higher levels (Wigfield & Eccles, 2000).

Long-term goals are also important. A participant's career goal is one example of a long-term-goal. Those who have selected a career closely related to an educational program tend to perform better than those who are indecisive about their goals (Alpern, 2000; Haislett & Hafer, 1990).

A participant's desire for lifelong learning may also influence motivation and academic achievement. Adult learners with a more positive attitude towards lifelong learning tend to be more persistent, more self-directed, and more self-confident (de la Harpe & Radloff, 2000). They efficiently use cognitive strategies to maximize their learning (Zimmerman & Martinez-Pons, 1992).

Institutional level factors
The CCNA program is taught in institutions at very different academic levels such as high schools, community colleges, and universities, as well as non-traditional education locations such as career centers and homeless shelters. Adult learners who wish to take the CCNA courses can register for courses in any of these educational

institutions. Although institutions need to meet minimum predetermined standards in order to offer the CCNA courses, the differences in terms of technical and instructional resources between these diverse ranges of institutions are inevitable and thus may have an impact on learner achievement.

The geographical location of an institution, whether urban, suburban, small town, or rural, is expected to have an impact on success due to the differences in organizational and social environments and the resources available (Barker, 1985; Hannaway & Talbert, 1993; Lee & McIntire, 1999). Although the patterns are not clear, the educational inequities in urban area institutions suggest that large achievement gaps could exist between participants in these institutions and their peers in suburban and rural institutions (Everson & Millsap, 2004; Kozol, 1991; Lee, 2001).

Research has found that one of the most influential factors in learner achievement is the participant's socioeconomic status (Bracey, 1995; Verstegen & King, 1998; Walberg, 1984). Being in a financially disadvantaged region or not could be used as a proxy to socioeconomic status. Traditional learners in financially disadvantaged regions such as empowerment zones and enterprise communities are expected to perform at a lower level than their peers in relatively developed regions (Tajalli & Opheim, 2005). It might be expected that students who took courses from institutions located in economically disadvantaged regions will achieve less than their peers in other regions.

The Cisco Networking Academy (CNA) manages the delivery of programs through the hierarchical structure of Cisco Academy Training Centers (CATC), Regional Training Centers (RTC), and Local Academies (LA). LAs are further from the source of the program, having little direct contact with Cisco Learning Institute or its CATCs. RTCs, on the other hand, are selected for their abilities and have direct contact with CATCs. It is expected that the higher the position of an institution in the CNA hierarchy, the higher the overall participant achievement would be because of the availability of physical, educational, and human resources.

Based on research findings in literature, a summary of factors affecting learner achievement and directions of their impact are presented in Table 1. In the literature there were no results on two institutional factors included in this study, namely type of institution and academy type.

Table 1- A summary of factors impacting learner achievement

Factors Investigated	Past Research Results (Achievement in favor of)
Learner Level Factors	
Gender	Males
Age	Mature or older learners
Job status	Learners with part-time or no full-time jobs
Computer technical ability	Learners with high technical ability
Motivation	Learners with high motivation
Career goal	Course related career goals
Lifelong learning	Learners with high value of life long learning
Institutional Level Factors	
Geographical location	Suburban locations
Economic development regions	Non-economic development regions
Type of Institution	No past research results
Academy type	No past research results

The purpose of this research study is to examine participant and institutional factors related to achievement of adult learners who participate in a technology certificate program. The results of this study are expected to enhance our understanding of the factors that impact adult learners' achievement in technology certificate programs. This may help researchers build an empirical framework that can guide research and practice in these programs. The research questions guiding the study are:

1. Which participant level factors have an impact on adult learner achievement in a technology certification program on computer networks?
2. Which institutional level factors have an impact on adult learner achievement in a technology certification program on computer networks?

METHOD

We used a multilevel data analysis approach to analyze data drawn from five separate sources including an online survey, class registration data, test achievement scores, and two public databases maintained by the U.S. government agencies. Data from these sources were organized as student level (Level 1) and institution level (Level 2). Participants were adult learners older than 18 years of age who were enrolled in CCNA certification programs with the goal of receiving either certification or no degree. A two-level hierarchical analysis procedure was run to calculate the impact of selected variables on student achievement.

Context

The Cisco Networking Academy was established in order to provide networking education to participants around the world. The Academy currently serves more than 400 000 participants at more than 10 000 high schools, community colleges, universities, and non-traditional settings in 149 countries. The Academy offers several programs, the most popular of which is the CCNA program. The CCNA program consists of four separate courses taken in sequence. The study's context is the first course of the CCNA program, which focuses on basic computer networking knowledge and skills.

The CCNA program provides a unique learning environment to instructors and students, which combines face-to-face and online course delivery modes. In face-to-face component, instructors have complete freedom in deciding how their courses will be taught and how the content may be modified to fit their students' needs. Some instructors use traditional lectures, some use small group discussion, and others use chapter tests to guide class discussion. Students and instructors access online course material using a propriety course management system. All student achievement is judged by the same final exam.

Participants

This study uses data from a large scale educational evaluation project conducted in the United States between August 2004 and May 2005 on the CCNA program from a population of 65 000 participants, approximately 20 000 surveys were completed, which provided a return rate of approximately 30%. As a subset of the collected data, the participants of this study were adult learners who completed the survey administered at the beginning of CCNA1 course. Two of the questions in the survey asked participants about their age and currently pursued degree by attending the CCNA program. Answers to these two questions were used as the selection criteria to identify adult learners as the participants of this study. We identified 2442 participants from 256 institutions who were older than age 18 and who identified their pursued degree as 'certificate' or 'non-degree'. The latter criterion was used to make sure that the adult learners attend the CCNA program solely for 'technology certification' or 'improving their skill base' rather than a requirement of their formal degree program. Detailed descriptive information about the participants is presented in Table 2, Table 3, and Table 4.

Data Sources and Measures

Using multilevel analysis methods, we analyzed five separate sources of data drawn from participants enrolled in the CCNA1 course: 1) A survey completed by participants at the start of the course and administered through the Academy course management system, 2) Demographic data provided to the Academy by participants upon enrolling in the program, 3) Final exam achievement from the online exam administered by the Academy to measure the knowledge gained from the program by participants, 4) Academy location from a U.S. Department of Education database, and 5) Financial development level of institutions' regions as determined by the Department of Housing and Urban Development database. Then data are organized in two levels: first, participant level factors; and second, institutional level factors.

Level 1: Participant level factors

The factors at this level are related to individual learners and are collected from participants.

Gender: Participant gender was obtained from class registration data.

Employment status: A participant's employment status was obtained by asking participants whether or not they were employed full-time.

Age: Participants' ages were determined by a question on our survey that asked their age using numbers between 15 and 65 with one year increments.

Adult learners' technical ability: We used self-reported computer skills as technical ability factors. These skills were measured on the survey via four items with 7-point Likert scales that asked participants to report the frequency of behaviors over the past year such as installing an operating system, dealing with computer hardware, and providing technical advice to others. Cronbach's alpha was .88 for the scale, indicating adequate reliability.

Motivation: We measured learner motivation using a scale drawn from Eccles and Wigfield (2002). The scale was developed based on value and expectancy theory. The scale had seven items with 5-point Likert scales,

which measured the placed value and expected success in the CCNA course. Cronbach's alpha for the scale was .86, indicating adequate reliability.

Career goal: The participants' career goals were measured by a single multiple choice question on the survey. If a participant has reported having a career goal as a networking specialist, or as an IT professional, the career goal was set to one; otherwise, it was set to zero

Reasons to take the course: The participants were asked why they took the CCNA1 course. The seven options were related to career, education, and advisor or friend recommendation. For the purpose of analysis, we created a variable that grouped career and education related reasons into one category and other reasons into another category. If a participant has stated career or educational related reasons for taking the course, the variable was set to one; otherwise, it was set to zero.

Lifelong learning: The desire for life-long learning was measured on the survey via a series of nine 5-point Likert scales drawn from Oddi, Ellis, and Roberson (1990), a continuing learning scale, and learning skills and styles inventory. Cronbach's alpha was .85, indicating adequate reliability for the scale.

Course achievement score: The dependent variable was the participant's course achievement score in the first CCNA course, i.e., the percent of test items answered correctly on final exam produced by the online testing system. The final examination tests for all CCNA courses are developed by the Cisco Learning Institute based on established standards.

Level 2: Institutional level factors

The factors at this level are related to the institutions where adult learners took the CCNA courses. The factors we examined are closely related to an institutions' ability to provide resources for education.

*Academy type:*All institutions offering the CCNA courses are classified as Regional Training Center (RTC) or Local Academy (LA) in this management structure, which we coded using an indicator variable in this study.

Economic development communities: In some financially depressed regions, the U.S. government may provide some economic advantages for the businesses and individuals in the regions. These regions are labeled as Empowerment Zones or Enterprise Communities. It is a good indicator of economic developmental level of a region and its community. Seven percent of academies in our sample are situated in communities that are classified as being economic development communities using the U.S. government's definition of Empowerment Zones and Enterprise Communities; these institutions were coded using an indicator variable.

Location type: We classified each institution's location by matching its ZIP code to corresponding locale definition code, 1 through 8, in National Center for Education Statistics (NCES) database. Institutions located in regions classified as 1 or 2 (central city) were coded as urban. Institutions classified as 3 or 4 (urban fringe) were coded as suburban. Institutions located in regions classified as 5 or 6 (town) were coded as town, and institutions classified as 7 or 8 (rural) were coded as rural. We used a set of three indicator variables (urban, town, rural), with suburban as the base case in the analysis.

Institution type: When institutions join the CCNA program, they register as high schools, community colleges (2- or 3-year post-secondary institutions), universities (4 or more year post-secondary institutions), or career centers (e.g., employment centers and corrections facilities). We used a set of three indicator variables (high school, university, career center), with community college as the base case in the analysis.

ANALYSIS

Since individuals nested within schools in our data, we used a multilevel analysis method, specifically the Hierarchical Linear Modeling (HLM) for the analysis. Traditional regression techniques were not well suited to our data (Raundenbush & Bryk, 2002). With traditional regression, there is a problem with the unit of analysis. If the data are analyzed at the lowest level, in our case participant level, then the impact of the institution must be omitted. It is likely that there is a significant correlation among the factors affecting individuals. This can erroneously inflate the significance and cause type 1 errors. HLM is utilized to analyze data collected in this type of multi-level research design (Hofmann, 1997; Raundenbush & Bryk, 2002; Snijders & Bosker, 1999). In the current study, a two-level model was used: the lowest level (level 1) was the participant; the second level (level 2) was the institution. Because there were two levels, we could calculate an R-squared at each level to identify the relative contribution of participant and institutional factors to the overall achievement (Snijders & Bosker, 1999).

RESULTS

Table 2 and Table 3 present the descriptive statistics of the participant level factors. All categorical factors were converted into dummy variables before they were entered into the multilevel analysis.

Table 2-Descriptive Statistics for Individual Level Categorical Factors

Factor name	Percent
Female	14%
Employment status - Full time working	51%
Career and education related reasons to take	75%
Degree	
Certification participants	54%
Non-degree participants	46%
Career goal	
IT related careers	79%
Other	21%
Age groups	
18-24	17%
25-35	33%
36 and More	48%

Table 3-Descriptive Statistics for Continuous Factors

Variable name	N	Mean	SD	Min.	Max.
Achievement scores	2442	76.34	16.87	0.00	100.00
Motivation	2442	4.43	0.51	1.00	5.00
Life long learning	2442	4.41	0.51	1.00	5.00
Technical ability	2442	4.22	1.91	0.00	6.00

Table 4 presents descriptive statistics for institution level variables. We used 256 academies in the multilevel analysis. Community colleges (as opposed to non-traditional institutions) represented the majority of academies (84%). Academies were evenly distributed among urban and suburban locations. Sixty-five percent of the academies in this study were classified as local academies (LA) while 35% of them were classified as Regional Training Centers (RTC).

Table 4-Descriptive Statistics for Institutional Level Factors

Factor name	Percent
Institution type	
High School	4%
Community College	79%
4-year university	4%
Non-traditional	13%
Location type	
Urban	52%
Suburban	35%
Town	8%
Rural	6%
Academy type	
RTC	36%
Local	65%
Economic development community	7%

Table 5 presents the result of HLM analysis. The analysis was run in two steps. At each step, new variables were introduced to the equation and the improvement in R-squared at both levels was noted. At step one, only participants' demographic, ability, and motivational factors were entered into the analysis. Participants' demographics, ability, and motivational factors could explain 11.5% of variation of scores within the academies and 19.3% of variation of scores between the academies. In step two, institutional factors along with the participants' demographics, ability, and motivational factors were entered. The variables in step two could explain 11.8% of variation in participants' scores at level one and 19.6% of variation between academies at level two. As shown in Table 5, none of the institutional level factors contributed significantly to the model.

Table 5-Result of Multilevel Analysis

	Step 1: Participant Factors		Step 2: Participant and Institutional Factors	
	Beta	**p**	**Beta**	**p**
Individual Learner Factors				
Gender (Female)	-17.35	.019	-17.61	.018
Degree orientation				
Non-Degree	3.24	.000	5.37	.000
Certification	Baseline		Baseline	
Employment status - Full time working	4.52	.000	4.52	.000
Age				
18-24	Baseline		Baseline	
25-35	3.56	.002	3.56	.002
36 and More	5.52	.002	5.56	.000
Technical ability	.69	.003	.69	.003
Motivation	2.99	.003	2.97	.003
Career goals				
IT related careers	-.17	ns	-.17	ns
Other	Baseline		Baseline	
Lifelong learning	1.23	ns	1.21	ns
Career and education reasons to take course	.60	ns	.60	ns
Factor interactions				
Gender and Motivation	3.65	.031	3.72	.029
Gender and Technical ability	-0.27	ns	-.30	ns
Institutional Factors				
Regional Training Center			1.32	ns
Economic development community			-1.51	ns
Institution location type				
Urban			.51	ns
Suburban			Baseline	
Town			1.06	ns
Rural			1.35	ns
Institution type				
High School			-2.48	ns
2-year College			Baseline	
4-year University			1.60	ns
Non-Traditional			1.88	ns
Level 1 R-Squared	.115		.118	
Level 2 R-Squared	.193		.196	

Table 5 indicates whether the variables were significant to explain the achievement of adult learners in the CCNA program. However, the beta coefficients did not indicate the relative importance of each variable on participants' achievement scores. We needed to convert these beta coefficients to standardized beta coefficients. Table 6 shows the relative importance order and the standardized beta of each factor on participants' achievement in the CCNA program.

Table 6-Relative Importance of Factors on Adult Learner Achievement

Importance	Factor	Standardized Beta
1	Gender (in favor of males)	0.360
2	Gender and motivation (in favor of females)	0.333
3	Age 36 and more	0.164
4	Full time working	0.134
5	Age 25-35	0.099
6	Non-certificate	0.096
7	Motivation	0.090
8	Technical ability	0.078

DISCUSSION

The multilevel analysis indicated that many factors affect learners' achievement in this technology certification program. Gender, age, work status, degree status, motivation, and technical ability played important roles in learner achievement at the learner level. At the institutional level, the analysis did not indicate any important factors that impacted learner achievement. Regardless of the type of institution offering the CCNA courses, adult learners performed equally well. Contrary to past research findings with traditional students in public schools (Hofmann, 1997; Lee & McIntire, 1999), our results indicated that adult learners in urban and rural settings performed as well as adult learners in the suburban settings.

The mean beta coefficients in Table 5 enabled us to draw some conclusions about factors influencing adult learner achievement in the CCNA program. Assuming that all ability and motivational factors were similar, some personal demographics had an important impact on adult learner achievement. To understand the impact of these factors, we can contrast two typical participants of the program using the coefficients in Table 5. In this case, a full-time working non-degree seeking male learner over age 36 scores approximately 27.7 percentage points higher than a female learner who is 18-24 years old without a full-time job. However, it should be noted that this is a hypothetical combination of personal attributes that may or may not occur in real life.

Table 6 with standardized beta coefficients ranks the relative importance of each factor. As listed in Table 6, male learners do better than female learners, learners with full-time jobs do better than learners who do not work full-time, older learners do better than younger learners, and learners with no degree orientation achieve more than certificate seeking learners. Level of learner motivation and level of technical ability at the beginning of the program contributes to the learner achievement. Additionally, interaction between gender and entry motivation level has significant impact on female learner achievement.

Among the main effects for the factors that were investigated in this study, our model indicated that the most important predictor of learner achievement was gender. The achievement difference between males and females significantly favors male adult learners even after accounting for technical ability, motivation, and other demographic and institutional level factors. There is some evidence that females do not do as well as males in math, science, and technology courses (Kennedy, 2000; Schreiber, 2002). The student body in the CCNA program consists of 85% male students. This might lead to significantly lower achievement of females.

Age was the second most important factor impacting learners' achievement in the CCNA program. When compared to the participants aged 18-24, both older learner groups (25-35 and 36 and older) achieve more in the CCNA1 course. This result is in line with previous research findings (Justice & Dornan, 2001). A possible explanation of this result might be the differences between younger and older learners in terms of cognitive development, life experiences, and acquired academic skills.

The direction of impact for full-time employment on learner achievement was unexpected. Contrary to literature and common understanding, participants who had full-time jobs achieved 4.52 percentage points more than the learners who did not work full-time. The interactions of employment factor with demographic, ability, and motivation factors did not yield a meaningful result that we can explain with the current data. However, it is possible that working participants could have better study skills and time management skills than their non-working counterparts, or that the content of the CCNA courses was more relevant to those in full-time positions. Another interesting finding from this analysis was that adult learners who were non-degree seeking learners achieved 3.26 percentage points more than learners who were in a certificate program. Non-degree seeking learners pursue the CCNA program for skill set increase rather than obtaining a degree. Contrary to the general stream of literature, learners without any degree aim achieved more than the learners with a certificate aim in the program. Interactions of other factors with this factor did not yield meaningful results, therefore requiring further investigation.

The motivational factor measured as the value of the program and expectancy from the program also had an impact on adult learner achievement in the CCNA program. As expected, the learners who highly valued the program achieved more in the program. Previous studies have shown similar results in the past with non-traditional undergraduate students (Allen, 1999; Eppler & Harju, 1997).

Learner ability has long been considered an important factor that influences achievement (Stinson, 2004). The analysis indicated that it is also important in the CCNA program for adult learners. Learners with high computer related technical ability at the beginning of the program performed better in the CCNA1 course than learners without these skills. However, no significant interaction of technical ability with other factors was detected.

The other participant level factors, such as career goals, desire for lifelong learning, and reasons to take the CCNA1 course, did not have an impact on achievement in the course. Although these factors have been considered as predictors of participation to lifelong learning and continuous learning activities (Creighton & Hudson, 2002; de la Harpe & Radloff, 2000; Livneh & Livneh, 1999), they did not have an effect on achievement in the CCNA1 course.

Finally, contrary to the literature, the analysis indicated no significant differences in adult learner achievement between Regional Training Centers and Local Academies, between financially disadvantaged and regular regions, and between different geographical locations. Achievement differences between geographical regions and different economic regions are well-documented in the literature. Students attending institutions in urban or rural areas, and institutions placed in economically disadvantaged regions show lower achievement than their peers in suburban or economically well developed regions (Kozol, 1991; Lee & McIntire, 1999; Lippman, Burns, & McArthur, 1996; Walberg, 1984; Young, 1998). However, our analysis indicated that differences between regions do not impact student achievement in the course.

CONCLUSION

This study can have important implications for educational practice to improve design, development and utilization phases of technology certificate programs on computers offered to adult learners. Based on the findings, several recommendations can be made that might impact learner achievement in hybrid or blended learning environments similar to the examined CCNA program. Gender is an important factor for learner achievement in any technology related program. Our findings confirm mainstream literature indicating that males perform better than females. Instructors and program designers for technology programs need to find and develop strategies that better support female learners in order to help them achieve as well as males in these types of programs.

The level of individual motivation is a factor that impacts all learners' achievement in the CCNA program. However, this factor affects females more than males. Interaction between gender and motivation reveals that females with more motivation achieve more than females with less motivation. This implies that, in order to increase their perceived value and success expectations about the programs, female participants should be well informed about the value of technology programs to their life before they begin.

One of the interesting findings in this study is the achievement of participants who work full-time. Contrary to findings from previous studies, full-time working participants in the CCNA1 course achieved more than participants without full-time jobs. With the current data, no explanation can be generated for this finding.

Another interesting finding is that there were no differences in achievement between participants in different geographical locations and institutions. The structure and the organization of the CCNA program provide equal opportunity and a learning environment for adult learners to succeed and to reach their own potential. This situation is most likely the result of using standardized curriculum and testing delivered over the Internet. Learners from all academies and regions have access to the same teaching/learning resources. The online delivery system takes the burden of class, material preparations, and student feedback tasks from instructors' shoulders and allows them to focus on more in-class activities and interactions with their students. This finding indicates that the technology certificate program provides a consistent quality of educational experience to all participants regardless of the institution and location where the program is offered, which could be considered as a contribution of the hybrid instruction or blended learning environments to education.

As in any large scale research study, the current study had certain limitations. First, since the data were collected using online methods, this study has the inherent limitations of survey research. The results reflect the learners who chose to complete the survey. There were no means to check the representativeness of our sample. Additionally, the survey items are self-reported (e.g., computer skills, program value), which may introduce social desirability bias.

In light of the findings, this study can have important implications for future research. First, our model indicated that the factors we studied may explain 11.8% of adult achievement at the learner level and 19.6% at the institution level in the CCNA1 course. There is still a large unexplained variance in the achievement scores. Future research should examine other learner and institutional factors that influence adult learners' program achievement such as instructor, instruction, and student engagement. Second, it is expected that learners with full-time jobs would do equal to or worse than learners without full-time jobs. However, our research found that learners with full-time jobs do better than learners without full-time jobs. Future research should explore time

management and study skills, and prior work and academic experiences of learners with full-time employment versus no full-time employment. Future research should investigate learner involvement with the program such as time on task, active learning strategies, and their relationship to student achievement. Third, it is likely that by studying local instruction, it would be possible to identify best practices. There may be some instructional practices applied locally that enhance achievement. Identifying these practices may assist in finding ways to further encourage and support participants in all types of technology certification programs. Finally, there are no achievement differences between different geographical, socioeconomic regions and institutions in this program. The current research shed light on important factors that impact adult learner achievement in technology certificate programs. Further research needs be conducted to understand this phenomenon by including other factors like the teaching resources, instructional quality, and teacher-student satisfaction from the program in these institutions.

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