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COMPARISON OF STUDENTS' SUCCESS IN AN INTERNATIONAL TECHNOLOGY CERTIFICATE PROGRAM*

ULUSLARARASI BİR TEKNOLOJİ SERTİFİKA PROGRAMINDA ÖĞRENCİ BAŞARILARININ KARŞILAŞTIRILMASI

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ABSTRACT: There has been a rapid increase in the number of technology certificate programs offered around the world in the last decade. While designing, developing, and implementing these programs little or no consideration is given to geographical, cultural and developmental differences between different regions of the world. This study investigates the students' success in the Cisco Certified Network Associate (CCNA) program – a unique model combining technology-supported learning with local instruction world-wide. The purpose of this study is to investigate how demographic, ability, and motivational factors impact student success in different regions of the world when the curriculum and teaching materials are the same for all students and teachers. 368,159 students who completed the technology course from August 2004 to December 2005 in 5,948 academies in 135 countries were examined. Based on ANOVA and regression, results show that prior achievement, technology skills, and degree impact student achievement regardless of regions' developmental level.

Keywords: student achievement, technology-supported learning environments

ÖZET: Tüm dünyada sunulan teknoloji sertifika programları son on yılda hızlı bir şekilde artmıştır. Bunların tasarımı, geliştirilmesi ve uygulanması süreçlerinde dünyanın farklı bölgeleri arasındaki coğrafik, kültürel ve gelişmişlik düzeyindeki farklılıklar çok az veya hiç dikkate alınmamaktadır. Bu çalışma, teknoloji destekli öğrenimi okul bazında öğretmen kontrolüyle birleştiren, dünya çapındaki Cisco Certified Network Associate programındaki öğrencilerin başarılarını değerlendirmektedir. Çalışmanın amacı program ve öğretim materyalleri aynı olduğunda demografik, yetenek ve güdüsel etkenlerin dünyanın farklı bölgelerindeki öğrenci başarılarını nasıl etkilediğini araştırmaktır. Bu çalışmanın kapsamında teknoloji eğitim programına Ağustos 2004 den Aralık 2005'e kadar 5.948 akademi ve 135 ülkede kayıt yaptırıp tamamlayan 368.159 öğrenci araştırmaya dâhil edilmiştir. ANOVA ve regresyon yöntemleri ile elde edilen sonuçlara göre öğrencilerin önceki başarılarının, teknoloji becerilerinin ve öğrenim durumlarının öğrencilerin başarılarına – bölgelerin gelişmişlik düzeylerinden bağımsız bir şekilde – etkisi olduğu görülmüştür.

Anahtar sözcükler: öğrenci başarısı, teknoloji destekli öğrenme ortamları

1. INTRODUCTION

The Internet has created new opportunities for teaching and learning in the same way it has created new opportunities for commerce since the introduction of graphical browser (Khan, 1998). Internet-based online learning has grown dramatically over the past decade, primarily as non-traditional students consider it an efficient and effective venue to obtain additional training and education (Welsh et. al. 2003). Although most online learning is conducted by having students and instructors interact primary through the Internet, one form, called blended learning, combines the Internet with traditional, face-to-face instruction (Osguthorpe & Graham, 2003; Polin, 2004; Stinson, 2004).

The purpose of this study is to examine factors that affect student achievement in technology-enabled learning environments. Students' abilities and motivation are primary factors in their achievement in addition to the environment in which they receive instruction (Lee, 2000). In this study the term "environment" refers to the country of the program. Certainly, the economical, cultural, and social factors in a country affect the achievement levels of the students in certain subjects such as mathematics and science. This has been well documented in three International Mathematics and

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Science studies and World Bank reports (Papanastasiou, 2002). However, they failed to address the commonality of the curriculum among the countries. We know that student achievement shows great variation when the curriculum utilized is different among the subjects studied (Shavelson, Webb, & Burstein, 1986). In this study, we examined how students' abilities and motivation factors affect their achievement in a technology-enabled, blended learning environment around the world.

Blended learning programs can be implemented in a variety of different ways. In this paper, we examine one blended learning program, the Cisco Networking Academy. This is a technology certificate program for computer networks, which combines centralized curriculum and standards-based testing delivered over the Internet with local instruction. In other words, the program provides the curriculum and teaching materials and allows instructors to use appropriate pedagogy in their classes.

Face-to-face environments typically provide high motivation and engagement for the students through direct interaction with their teacher and other students, which enables the student to receive feedback and quickly test his/her understanding (Chickering & Gamson, 1987). Face-to-face teaching and learning methods are also familiar and comfortable learning methods for many students. On the other hand, online learning environments create new opportunities for curriculum development and implementation (Hill et. al., 2004). Online learning materials can be customized and can even self-adapt to students' learning styles and levels of expertise. Online materials may be better suited to those who are self-directed students. The combination of the online learning environment and student-instructor interaction in a face-to-face learning environment may offer benefits beyond either one alone (Cashion & Palmieri, 2002). Because such learning environments are relatively new, few studies have evaluated their effectiveness and the factors affecting student achievement (Dennis et. al., 2006).

It is expected that many of the same factors affecting student success in traditional learning environments (e.g., aptitude, motivation, and instruction) should also affect student success in blended learning environments (Walberg, 1984). One question, however, is whether this form of technology-enabled learning can be equally effective in a variety of different countries. Considering the economic, social, and cultural differences of the countries, will the same factors affect student achievement when students and instructors are given exactly the same curriculum and materials?

The nature of the CCNA program provides a very rare opportunity for educators to examine factors affecting student achievement around the globe. Since technology-enabled learning environments can be developed and implemented in different ways, it is difficult to discuss the impact of these environments on student achievement. Therefore, in the rest of this paper, we focus on one specific technology-enabled learning program, the Cisco Networking Academy, and examine individual factors in different regions of the world that affect the success of its students. The results of this study provide knowledge for designing or improving such learning environments in different countries of the world.

2. METHODOLOGY

2.1. Context

The context of this study is a technology certificate program which offers computer networking courses world-wide. The program has a standardized curriculum and teaching materials over the Internet and instructors in the schools implement the instruction in live classes. The Cisco Networking Academy was established to provide networking education to students around the world. The academy currently serves more than 400,000 students at almost 10,000 high schools, community colleges, universities, and non-traditional settings (e.g., career centers, correctional facilities, shelters) in more than 150 countries around the world. The Academy offers several programs, the most popular of which is the Cisco Certified Network Associate (CCNA) program. The CCNA program consists of four separate courses taken in sequence.

There are four key components to the Cisco Networking Academy program: 1) a centralized curriculum distributed over the Internet; 2) standards-based testing distributed over the Internet; 3)

locally customized instruction; and 4) an instructor support system for training, support, and certification.

First, all curriculum materials are designed by a Cisco team consisting of subject matter experts and educators and then distributed over the Internet (traditional paper textbooks are also available, but not widely used). The curriculum is updated regularly based on task analyses of what network engineers need to work effectively in organizations. Instructors and students may access materials from any computer with a Web browser using a proprietary course management system. The curriculum includes online, interactive learning materials such as readings, pictures, and animations, as well as a series of exercises intended to be conducted in a network lab. Network simulation tools are an optional part of the curriculum. Instructors can supplement the curriculum materials; the curriculum provided by Cisco is the minimum amount of material that must be covered.

Second, the standards-based competency tests provided by Cisco include both interactive online exams and hands-on practicum tests. These tests are developed by the same Cisco group that develops the Cisco certification exams and are intended to cover the same material to the same standards. The tests provide immediate personalized feedback that highlights mistakes and directs students via links to sections of the curriculum they need to relearn. The CCNA program defines minimum standards that students must achieve before they can progress to the next CCNA course. More than 30,000 online tests are taken each day.

Third, instructors have complete freedom in deciding how their courses are taught. Some instructors use traditional lectures, others use small group discussion, while others use chapter tests to guide class discussions. Instructors are also encouraged to decide how they want to use the standards-based tests to determine students' grades for their school courses.

Finally, there is an extensive support system for instructors. All instructors must pass certification exams for each CCNA course before they can teach it. Instructors must take 16 hours of professional development each year and be re-certified every three years. Each school offering the CCNA program is linked to a Regional Training Center (RTC) that assists in delivering the program and is invited to one meeting run by that RTC each year. All instructors have access to a 24/7 technical support hotline. Cisco provides an online community for instructors, so that they can share teaching tips, teaching materials, and advice.

2.1.1. Participants

Participants of this study are students who enrolled and completed the first course of the four-course CCNA program in English language around the world. A total of 368,159 students enrolled in the CCNA1 course during the study (from August 2004 to December 2005) in 5,948 academies in 135 countries. Overall 51,941 of the enrolled students completed the data collection instrument in 4,823 academies in 133 countries, resulting in a 14.1% return rate. Countries were categorized based on similarities in economical development, culture, and regions. As a result of this categorization, 12 regions were established. These regions were established through collaborating with Cisco Learning Institute. Figure 1 shows the classification of these countries.

Academies with less than 5 survey responses and less than 5 students completing the course were eliminated. Table 1 shows the number of academies and completed surveys for each region of the world for the academies with more than 5 students for both completed survey and the CCNA1 class.

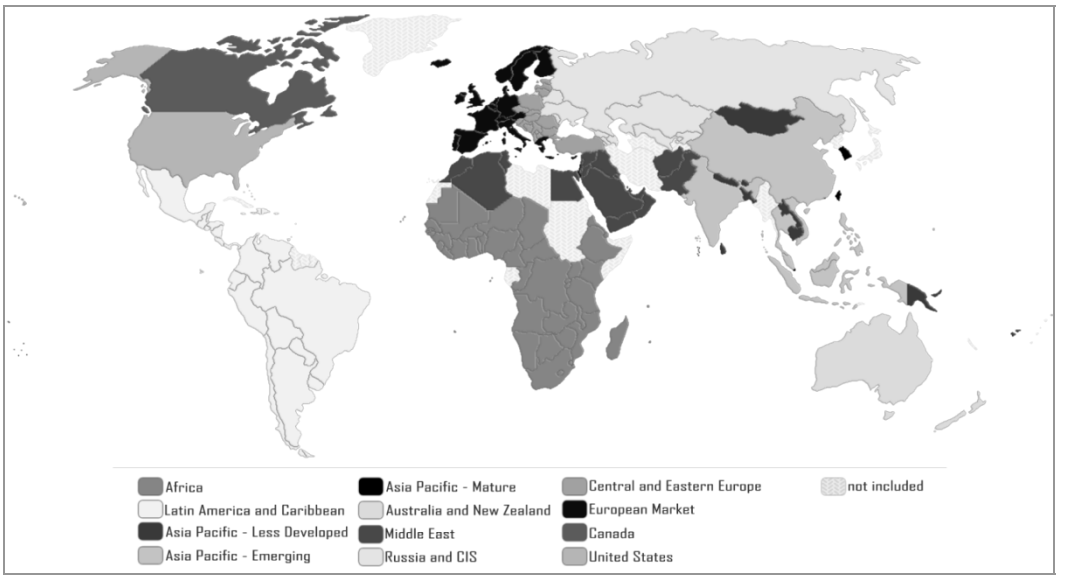

Figure 1: Classification of The Countries Into 12 Regions

As shown in Table 1, the majority of students are from the United States region. The Asia-Pacific Less Developed, and Russia and CIS regions have the fewest number of completed surveys and the lowest number of academies.

Table 1: Number of Academies and Number of Students in Each Region

	Africa	Latin America and the Caribbean	Asia Pacific – Less Developed	Asia Pacific – Emerging	Asia Pacific –Mature	Australia and New Zealand	Middle East	Russia and CIS	Central and Eastern Europe	European Market	Canada	United States	Total
Number of academies	76	91	20	253	77	89	74	26	173	471	75	1,121	2,546
Number of students completing the survey	2,562	1,607	487	7,401	2,513	1,674	1,087	287	3,301	6,781	1,614	17,322	46,636

2.1.2. Instruments and Data Collection

Two instruments were utilized in this study: An entry survey and a final exam. The survey measures students' technical skills, motivation, personal development measures, educational and career aspirations, and reasons for taking the CCNA1 class. The survey was administered online at the beginning of the CCNA1 class. All students who were enrolled in the CCNA1 class received an e-mail inviting them to complete the survey. Additionally, a reminder message about the survey appeared on their course entry page when they logged into their course suite in the CCNA course system. The message stayed there until the students took the survey or they passed the half of the course during the semester. Participation in the study was voluntary.

The second source of the data was student final exam scores. At the end of the CCNA1 course students take a final exam prepared and administered online by the Cisco Networking Academy. The final exam scores were recorded by the Cisco Networking Academy and transferred to the researchers in this study.

2.2. Measures

We analyzed the impact of six main measures on student success measured with final exam scores in the CCNA program. The following is a list of measures impacting student success in the program. Table 2 presents distribution of each factor across the regions.

Gender: Student gender measured as male and female. The CCNA program is a computer technology program, and males often have greater ability and interest in computers than do females (Crombie & Abarbanel, 2000; Green, 2000). Thus, we believed it was important to track gender. This information is obtained from course registration. Female was marked "1" and male was marked "0."

Degree: Each student's current educational degree was also obtained. We asked students about their current educational degree giving them the choices of High School, Community College, Certificate, Bachelor, Graduate, or No Degree. Later, Community College, Certificate, and No Degree categories were collapsed into the "Other" category. Each of these categories was converted into "dummy variables."

GPA: We asked students to report their grade point average in the last semester or the last formal education institution they attended to capture their prior academic ability. Prior academic ability of students is an important predictor of student achievement (Gray & Jesson, 1990; Hakkinen, Kirjavainen and Uusitalo, 2003; Walberg, 1984; Young, 2000). Although there has been much debate on the use of self reported GPAs, individual and meta-analysis studies show that the validity of student self-reported GPAs are acceptable for research and practical purposes (Cassady, 2001; Kuncel, Crede and Thomas, 2005). Students were given a range of letter grades from "A+" to "D or Below". These letter grades were converted into numbers between 4 and 1.

Technical skills: The focus of the CCNA program is on computer networking, so prior computer skills are another important ability that might affect student achievement. The more general knowledge of computers that student have, the more likely they will be to master new networking knowledge they learn in the program. Also, the curriculum and tests are distributed over the Internet, which might inhibit the learning of students with poor computer skills (Cashion & Palmieri, 2002; Kennedy, 2000). Self-reported computer skills were measured on the survey via four 6-point Likert scales and asked students to report the frequency of behaviors over the past year such as installing an operating system, dealing with computer hardware, and providing computer advice to others. Coefficient alpha (Cronbach, 1951) of these four survey items to stand together as a construct was .88, indicating adequate reliability.

Motivation: Motivation is another factor considered. Individual's beliefs, goals, and expectancies are related to being engaged or disengaged in learning; many studies have linked motivation and engagement to individuals' achievement (Eccles & Wigfield, 2002). The expected value of a behavior is an important motivator in the short-term (Eccles & Wigfield, 2002). The expected value of the CCNA program to the student was measured on the survey by four 5-point Likert scales (drawn from Wigfield & Eccles, 2000). Coefficient alpha (Cronbach, 1951) was .86, indicating adequate reliability.

Reasons to take the course: Students' reason for taking the course is another short term motivation indicator. Reasons for taking the course were measured with a single item and eight reasons. Later these eight reasons were collapsed into three main categories; career related, education related, and other reasons. Each category was then converted into a dummy variable where "1" indicated that the reason exists and "0" indicated the opposite.

Career choice: Long-term motivation is also important for achievement. One potential source of long-term motivation is the student's career goal. Students who have selected a career goal closely related to an educational program tend to perform better than students who are indecisive about their goals (Alpern, 2000; Haislett & Hafer, 1990). Career goals were measured with a single item with seven options. These options were collapsed into three categories which are computer networking, IT oriented but not networking, and other. Each category was then converted into a dummy variable where "1" indicated that the career selection exists and "0" indicated the opposite.

Achievement measure: Students' final exam score was used as achievement measure in this study. Each student enrolled in the CCNA program has to reach certain achievement to take the next course in the program. Because the program uses a mastery approach, students can take a final exam of a CCNA course as many times until they exceed the threshold score. However, for each new try, the threshold for being successful is increased by the system. Therefore, we used students' first attempt final exam scores as student success measure.

Table 2 shows the distribution of scores for each measure across the 12 world regions. Table 2 reveals some interesting points. The majority of students in the program are male regardless of their region. The Russia and CIS, and European Market have the lowest proportion of female students (5.1% and 8.8% respectively). The distribution of student degrees does not show a consistent pattern across the regions. Although the program is popular among university and other degree students in developing countries, it is equally popular among high school students in more developed countries. The majority of students indicated career related reasons for enrolling in the program. This pattern is consistent across the regions with the exception of Asia-Pacific Mature. In all regions, students indicated that they would like to select computer networking as a career in the future.

Table 2: Distribution of Main Measures Impacting Student Achievement Across Regions

	Africa	Latin America and the Caribbean	Asia Pacific – Less Developed	Asia Pacific – Emerging	Asia Pacific –Mature	Australia and New Zealand	Middle East	Russia and CIS	Central and Eastern Europe	European Market	Canada	United States	Total
GPA	3.09	3.38	3.41	3.31	3.10	3.20	3.26	3.34	3.18	3.09	3.25	3.29	3.24
Technology Skills	2.94	3.96	3.67	3.22	2.58	4.28	4.09	5.11	4.84	4.49	4.38	3.90	3.85
Motivation	4.60	4.42	4.43	3.97	3.38	4.24	4.32	4.38	4.40	4.17	4.25	4.33	4.22
Female	24.5%	15.4%	30.5%	23.9%	25.9%	11.7%	16.3%	5.1%	10.5%	8.8%	11.2%	15.6%	16.5%
Degree													
High School	5.6%	20.9%	4.9%	20.8%	22.9%	12.9%	16.0%	30.0%	26.9%	18.0%	18.1%	30.0%	22.9%
Bachelor	38.1%	31.7%	55.3%	46.5%	17.8%	25.2%	50.2%	28.0%	26.5%	29.1%	16.3%	12.0%	25.5%
Graduate	3.8%	5.5%	12.4%	8.5%	5.9%	12.9%	11.9%	16.8%	19.9%	7.6%	2.2%	2.3%	6.4%
Other	52.5%	41.9%	27.4%	24.2%	53.4%	49.0%	21.9%	25.2%	26.7%	45.3%	63.4%	55.7%	45.2%
Career choice													
CCNA Career	58.3%	41.5%	61.5%	35.6%	24.6%	51.9%	50.3%	57.8%	57.3%	52.3%	47.2%	50.1%	47.4%
IT Career	24.7%	19.7%	13.8%	29.6%	28.6%	25.8%	14.2%	16.9%	22.7%	24.0%	27.6%	23.1%	24.5%
Other	17.0%	38.8%	24.7%	34.8%	46.8%	22.3%	35.5%	25.3%	20.0%	23.6%	25.2%	26.8%	28.1%
Reasons to Enroll													
Career Related	65.3%	66.0%	66.7%	45.7%	22.9%	46.9%	59.4%	56.0%	52.8%	44.0%	40.6%	43.9%	46.3%
Education Related	19.2%	10.4%	13.7%	19.2%	13.1%	13.9%	12.8%	22.0%	18.4%	11.1%	13.1%	16.2%	15.7%
Other	15.5%	23.6%	19.6%	35.1%	63.9%	39.2%	27.8%	22.0%	28.8%	44.9%	46.3%	39.8%	38.1%
Exam Score	71	78	77	71	65	76	76	83	84	74	71	69	72

2.3. Analysis

We used ANOVA to determine if the overall achievement scores are different across the regions. Then we used multiple regression analysis to identify factors that have impact on student achievement individually for each region. Before the analysis, the data were aggregated at the academy level which means, for each factor, one average number was obtained for each academy. For scale measures (GPA, motivation, achievement, technical skills), a mean of all students in an academy was assigned to that academy. For nominal measures (gender, degree, career choice, reasons to enroll),

students were aggregated to percentages and these percentages were assigned to corresponding academies. Using these converted measures, a multiple regression analysis was run to understand the impact each factor had on student achievement in the 12 different regions of the world.

3. RESULTS

Table 3 shows the overall mean scores of CCNA1 final exam results in each region. These final exam scores represent the student achievement scores. As seen from the table, the Central and Eastern Europe, and Russia and CIS regions have the highest mean score overall. AP Mature, United States, and Africa regions have the lowest scores on the CCNA exams.

Table 3: Overall Achievement Scores by 12 Regions on the World

Region	Mean
Africa	70.2
Latin America and the Caribbean	77.1
AP - Less Developed	75.7
AP - Emerging	72.8
AP -Mature	63.9
Pacific	73.7
Russia and CIS	82.8
Central and Eastern Europe	83.7
European Market	75.2
Canada	70.7
Middle East	76.0
United States	68.5

Note: The highest score is 100

In order to understand the significant differences between the regions, an ANOVA analysis was run where the final exam measure is the outcome variable and regions of the world is the fixed factor. Tukey's post-hoc analysis revealed that there are indeed significant achievement differences among regions ($F = 47.395$ $p < .000$). Table 4 shows the classification of regions based on student achievement scores. According to Table 4, there is no consistent grouping among the developed and developing regions in terms of student achievement. Developed regions such as the United States and Canada have lower achievement scores than less developed or developing regions such as the Middle East.

Table 4: Classification of the Regions Based on Mean Student Achievement Scores in the CCNA Program

Region	Num. of Academies	Low	Mid-Low	Mid-High	High
AP -Mature	77	63.9			
United States	1121	68.5			
Africa	76		70.2		
Canada	75		70.7		
AP - Emerging	253		72.8		
Australia and New Zealand	89		73.7		
European Market	471			75.2	
AP - Less Developed	20			75.7	
Middle East	74			76.0	
Latin America and the Caribbean	91			77.1	
Russia and CIS	26				82.8
Central and Eastern Europe	173				83.7

Classification of overall achievement scores did not yield a consistent pattern among the regions. A regression analysis was run to understand factors affecting student achievement within the

regions. Table 5 shows the standardized coefficient values for significant factors in the 12 different regions.

Table 5: Regression Analysis Results for Each Region Showing Standardized Coefficients for Significant Factors

Factors – Std. Betas	Africa	Latin America and the Caribbean	Asia Pacific - Less Developed	Asia Pacific - Emerging	Asia Pacific -Mature	Australia and New Zealand	Middle East	Russia and CIS	Central and Eastern Europe	European Market	Canada	United States	Commonalities
GPA	.35			.21		.22	.52	.23	.17			.13	7
Motivation	.29	.39								.28	.42	.19	5
Technology Skills				.23		.23	-.47	.20	.16			.10	6
Gender							.80					.13	2
Enrolment reasons													
Career-related								-.24		.39			2
Education-related													
Other	**Baseline**												
Student degree													
High School	.28		.86	.25		-.26		-.174				-.24	6
Bachelor				.25								-.058	2
Graduate				.18				.22	.20				3
Other	**Baseline**												
Career choices													
CCNA career										-.39			1
IT non-CCNA career													
Other	**Baseline**												

Results show that certain factors of students matter for student achievement in the CCNA program. However, these factors are not the same for each region. Student achievement is affected by different factors in each region. First, a great amount of commonality exists for prior achievement among the regions. Students' prior academic achievement is an important factor in seven regions in the world. In all of them it is positively correlated with student achievement in the CCNA program. Table 5 shows that students with higher prior achievement do better in the CCNA program. This is especially true in Africa and Middle East. Second, students' technology skills have importance in student achievement. Because the CCNA program is heavily related to computers and the content is delivered via the Internet, the students' technical abilities contribute positively to their achievement in the six regions of the world. Only in one region, Middle East, it is negatively correlated with student achievement. Third, students' current degree is also important in their achievement for six regions. However, it shows a different impact for different regions. For example in the United States, Non-Traditional and Community College students (collapsed as Other), perform significantly better than high school and bachelor degree students. On the other hand, an opposite relationship is true for the Asia-Pacific Emerging region, where all degree students significantly outperform the students in the other category. Fourth, short-term motivation of the students has positive impact on their achievement. In five of the 12 regions, motivation showed positive influence on student achievement with similar impact levels.

Gender, enrollment reasons, and career choice factors have limited impact on student achievement in only a few regions. Gender showed impact on student achievement only in the United States and Middle East regions. Results indicate that male students outperform females in these regions. Similar to gender, enrollment reasons are only important in Russia and European regions. Finally, career choices have negative impact on student achievement in only the European region.

Some regions draw attention as very few of the examined factors have impact on student achievement within those regions. For example in the Asia-Pacific Mature region, none of the

examined factors had impact on student achievement. Similarly, in Latin America and the Caribbean, and in Canada, only the motivation factor has impact on student achievement.

4. DISCUSSION AND CONCLUSION

The Cisco Networking Academy is a technology enhanced learning environment where the curriculum is delivered online and implemented in the classrooms. The learning environment serves a broad audience, from high school students to non-traditional learners, in more than 150 countries. One of the goals of the program is to provide a common curriculum over the Internet in a blended learning environment to standardize the learning taking place. This hypothesizes that the difference in the student success between the regions is minimized. However, it is inevitable that due to economical, cultural, and educational system differences, the factors affecting student achievement will not be the same for all regions. The results of our analyses show that there are in fact differences in student achievement and factors affecting achievement.

There are a number of commonalities and differences across regions. Students' prior academic achievement is the most common factor affecting CCNA success. Although it is an important factor for seven regions, it does not impact achievement in the remaining five regions. Similarly, technology skills are important for six regions and not important for the remaining six regions. Students' degree shows a variety of impacts on student achievement among the regions. While in developing countries high school students perform better than non-traditional students, in developed countries non-traditional students perform better than high school and bachelor degree students. However, none of these factors can be consistently grouped based on the development level of the countries.

Commonalities across the regions are concentrated on enrollment reasons and career choices of the students. In the majority of the 12 regions, factors relating to students' career choices and their reasons for enrolling in the CCNA program do not have impact on student achievement. Students with career, education, or other reasons to enroll the program and students with CCNA, Information Technology (IT), or other career choices perform equally well in the CCNA program. This is an important finding because the program helps students to achieve even though they are not certain about their career choices. The impact of student's gender is a surprising result because generally males outperform females in science and technology classes (Green, 2000). However, our results show that it is only true in the United States and Middle East regions. For other regions female and male students perform equally well in the CCNA program. This is particularly important because the structure of the program helps to close achievement gap between the genders across the world.

Our analysis show that impact of students' prior achievement, technology skills, and their degree is visible on the student achievement; however, it cannot be classified based on a region's level of development. These factors have similar effects on student achievement in developed and developing regions in the world. Student's gender, enrollment reasons, and student career choices do not have impact on student achievement in the majority of regions. These results show that technology enabled learning environments enable students to reach their own potential to be successful in a certificate program. Content delivery using the Internet can help to improve student achievement in the developing regions; however, differences between the regions mask our understanding for how the Internet can help to improve education in the world as no consistent patterns were obtained for student achievement and factors affecting student achievement. Further research is necessary to understand implementation of the CCNA program, student satisfaction, and interactions between them for improving further applications.

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GENİŞLETİLMİŞ ÖZET

Son on yılda tüm dünyada sunulan teknoloji sertifika programlarında ciddi bir artış vardır. Bunlar genelde teknoloji destekli ortamları kullanan fakat tasarımı, geliştirilmesi ve uygulanması süreçlerinde dünyanın farklı bölgeleri arasındaki coğrafik, kültürel ve gelişmişlik düzeyindeki farklılıklar çok az veya hiç dikkate almayan programlardır. Dünyanın farklı bölgelerinde bu programlara kaydolan öğrencilerin içeriği öğrenmek için aynı biçimde programı kullanacağı, yukarda bahsedilen farklılıkların öğrenci başarısını etkilemeyeceği varsayılmaktadır.

Bu çalışma Cisco Sertifikalı Bilgisayar Ağları Uzmanı (Cisco Certified Network Associate-CCNA) adlı dünyanın farklı bölgelerinde uygulanan bir yaygın teknoloji sertifika programındaki öğrenci başarılarını ve bu başarılara etki eden değişkenleri araştırmaktadır. CCNA programı teknoloji destekli öğrenmeyi yerel öğretimle birleştiren dünya çapında uygulanan eşsiz bir eğitim modelidir. Programda uygulanan müfredat dünyanın her yerde aynı içerik olacak biçimde standart halde kullanılmaktadır. Program merkezi sunucular üzerinden çevrimiçi olarak uygulanmaktadır. Hem öğrencilerin hem de öğretmenlerin çevrimiçi materyallere erişimi vardır. Öğretmenler çevrimiçi olarak erişilen standart program içeriğini gerçek ortamda, yüz yüze öğretimde kendi seçtikleri bir yöntemle kullanmaktadırlar. Bu çalışmanın amacı program ve öğretim materyalleri aynı olduğunda demografik, yetenek ve güdüsel etkenlerin dünyanın farklı bölgelerindeki öğrenci başarılarını nasıl etkilediğini araştırmaktır.

Bu çalışmanın katılımcıları CCNA programı öğrencileridir. Toplam dört dönemden oluşan CCNA teknoloji sertifika programının ilk dönemine Ağustos 2004 den Aralık 2005'e kadar 5.948 akademi ve 135 ülkede kayıt yaptırıp tamamlayan 368.159 öğrenci bulunmaktadır. Bu öğrencilerin tamamı bu çalışmanın katılımcılarıdır. Araştırmada iki veri toplama aracı kullanılmıştır. İlk olarak öğrencilerin temel demografik bilgilerini, teknik becerilerini, güdülerini, kişisel gelişim ölçümlerini, eğitim ve kariyer esinlenmelerini ve eğitimi alma nedenlerini belirlemek için "Entry Survey" adında bir anket uygulanmıştır. Bu anket öğrenciler döneme kayıt olduktan hemen sonra cevaplandırılmak için çevrimiçi erişime konulmuş ve ders konularının yarısı yüz yüze ortamda işlenene değin erişimde bırakılmıştır. İkinci veri toplama yöntemi olarak öğrencilerin dersin sonundaki bilgi düzeylerini ölçmek için bir final sınavı yapılmıştır. Bu sınav Cisco şirketi tarafından geliştirilmiş ve uygulanmıştır. Sınav geçerliliği ve güvenilirliği ölçülmüş standart sınav sorularından oluşan bir havuzdan rastlantısal seçilmiş sorulardan oluşmaktadır. Bu sınavı da öğrenciler son derste çevrimiçi olarak almışlardır.

Bölgeler arasındaki farklılığı anlamak ve bu farklılığa neden olan etkenleri belirlemek için iki istatistiksel analiz tekniği kullanılmıştır. Genel başarı notlarının dünyanın 12 farklı bölgesinde birbirinde farklı olup olmadığını belirlemek içi bağımlı değişken olarak final sınavı notlarının kullanıldığı bir ANOVA yapılmıştır. Her bölgedeki öğrenci başarısını etkileyebilecek potansiyel etkenleri belirlemek için ayrı ayrı regresyon analizi yapılmıştır. İncelemeden elde edilen bilgiler her bölgedeki öğrenci başarısını bağımsız olarak tahmin etmek için önceden belirleyici değişken olarak kullanılmıştır. Ölçekli (scale) ölçümler (GPA, güdü, başarı notu, teknik beceriler) için tüm öğrencilerin ortalaması ilgili akademiyle ilişkilendirilmiştir. Adsal (nominal) ölçümler (cinsiyet, mezuniyet, kariyer seçimi, katılım nedeni), için öğrenciler yüzdeliklere göre gruplandırılmış ve ilgili akademiyle ilişkilendirilmiştir.

Veri analizi sonuçları bölgeler arasında öğrenci başarısında anlamlı farklılıklar olduğunu göstermektedir. Bu sonuç ANOVA istatistiksel analizinin çıktısıdır ve buna göre bölgelerin gelişmişlik düzeyi farklılıklarına göre bir gruplandırma çıkmamaktadır.

Çalışmada veri analizi için kullanılan çoklu regresyon sonuçları öğrencilerin önceki başarılarının, teknik becerilerinin ve mezuniyet durumlarının başarılarına etkisi olduğu görülmüştür; ancak bu etki bölgelerin gelişmişlik düzeylerine göre yine gruplandırılamamıştır. Önceki başarı (GPA) yedi bölge için ortak önceden belirleyicidir. Öğrencilerin teknik becerileri altı bölgede başarılarını olumlu yönde etkilemektedir. Ancak sadece Ortadoğu bölgesinde öğrenci başarısıyla negatif ilgileşim vardır. Altı bölgede etkili olan diğer bir etken öğrencilerin mezuniyet durumudur. Bu etken farklı bölgeleri farklı biçimde etkilemektedir. Örneğin Amerika Birleşik Devletlerinde geleneksel olmayan

(çalışan) ve meslek yüksek okul mezunu öğrenciler lise ve lisans mezunu öğrencilerden anlamlı biçimde daha fazla başarı göstermektedir. Öte yandan Asya Pasifik hızlı gelişen ülkelerde tüm mezuniyet bildiren öğrenciler "diğer" olarak tanımlanan öğrencileri anlamlı biçimde geçmektedir. Öğrencilerin güdüsü 12 bölgenin beşinde başarılarını olumlu etkilemektedir. Güdülenme benzer etkililik değerleriyle öğrenci başarısını etkilemektedir. Cinsiyet, katılım nedeni ve öğrenci kariyer seçimi değişkenlerinin bölgelerin büyük çoğunluğunda öğrenci başarısına etkisi olmadığı bulunmuştur. İncelenen etkenlerin hiç birinin Asya Pasifik gelişmiş ülkeler bölgesinde öğrenci başarısını etkilemediği görülmüştür. Benzer biçimde Latin Amerika ve Karayipler'de ve Kanada'da sadece güdülenme etkeninin öğrenci başarısına etkisi vardır.

Bu araştırmanın bulguları öğrencilerin cinsiyeti, eğitim programına katılım nedenleri ve öğrencilerin kariyer seçimleri değişkenlerinin öğrenci başarısını dünyanın farklı bölgelerinin çoğunda etkilemediğini göstermektedir. Diğer bir deyişle, bu değişkenler dünyanın gelişmiş ve gelişmekte olan bölgelerinde CCNA programına kayıtlı öğrencilerin başarısını aynı biçimde etkilemektedir. Bu sonuç çarpıcı bir biçimde CCNA ve benzeri teknoloji destekli öğrenme ortamlarının öğrencilerin dünyada bulundukları bölgeden bağımsız olarak başarılı olmak için kendi potansiyellerini kullanabilmelerini sağladığını da göstermektedir. Bunun ötesinde, araştırma bulguları programın yapısının dünyada cinsiyetler arasındaki başarı farklılığının diğer bilim ve teknoloji odaklı öğrenme programlarının aksine azalttığını göstermektedir. Bu çalışmada pek çok önemli bulgu edinmekle birlikte CCNA ve benzeri teknoloji destekli sertifika programlarının uygulanma süreçlerini, öğrenci doyumu ve öğrenci etkileşimini daha iyi anlayabilmek için bu çalışmanın ötesinde daha başka araştırmalara da gereksinim vardır. Bu tür çalışmalar internet ve diğer teknoloji destekli öğrenme ortamlarının dünyada gelişmişlik düzeyinden bağımsız olarak öğrenmede fırsat eşitliği yaratabileceğinin ipuçlarını vermektedir.