

Cisco Networking Academy Evaluation Project
White Paper – WP 06-02.1
May 2006

Characteristics of Students in the Cisco Networking Academy: International Analysis

Alan Dennis
Kelly McNamara Hilmer
Semiral Oncu
Thomas Duffy
Barbara Bichelmeyer
JoAnne Bunnage
Hasan Cakir
Ali Korkmaz
Omer Delialioglu



**Kelley Executive Partners
Indiana University**

✉ Kelley Executive Partners
Indiana University
1275 East Tenth Street, Suite 3070
Bloomington, IN 47405-1703

☎ 812-856-2454
☎ 812-855-6216 (fax)
✉ jbunnage@indiana.edu
🌐 www.indiana.edu/~iuteam

PREFACE

This white paper is one in a series of reports that examines the success of students enrolled in the Cisco Certified Network Associate (CCNA) Program offered through the Cisco Networking Academy. For a list of available reports, see our Web site (www.indiana.edu/~iuteam). We presume that the reader is familiar with the Cisco Networking Academy and the CCNA program.

The purpose of this white paper is to describe the findings from the analysis of the international data collected through the CCNA1 Student Survey. The CCNA1 course is the first course in the four-course CCNA program worldwide. The survey was available for students August 2004 thru February 2006. While previous white papers focused only on students in the United States, this paper presents all of the English speaking students who responded worldwide. The student descriptions are clustered among 12 global regions.

The Cisco Networking Academy serves more than 400,000 students at almost 10,000 “academies” located in high schools, community colleges, universities, and non-traditional settings (e.g., career centers, correctional facilities, shelters, military bases) in more than 150 countries around the world. The CCNA program is the Academy’s most popular program.

The Cisco Networking Academy offers a unique education model that combines a centralized curriculum with local control. The course and laboratory materials, the sequence of instruction, and the assessment system are all centrally developed by technical and educational experts working together with the support of Cisco Systems, Inc. All materials are delivered over the Internet, but courses are taught in the classroom by local instructors at each academy who are free to adapt the materials to their local context. Instructional quality is supported by initial instructor training and annual professional development, as well as by an online community of instructors and 24/7 technical support. The quality of instruction is monitored through student performance on the end-of-course exams and through student course evaluations – both of which are common to all courses.

The CCNA curriculum is an applied educational curriculum designed to meet the needs of practicing network engineers. It is designed to provide both deep conceptual understanding and practical skills. Indeed, the curriculum is aligned with teaching standards for United States high school math, science, and language arts education.

This research was sponsored by the Cisco Learning Institute
www.ciscolearning.org



Characteristics of Students in the Cisco Networking Academy: International Analysis

WHO ARE THE STUDENTS?

The goal of this report is to examine the attributes, abilities, and aspirations of students enrolled in the first course in the Cisco Certified Network Associate (CCNA) Program offered through the Cisco Networking Academy. We administered an intake survey from August 2004 to February 2006. The survey was available only in English, so only students who took their course in English were included in our analysis. Thus, all data reported in this white paper represent only these English speaking students.

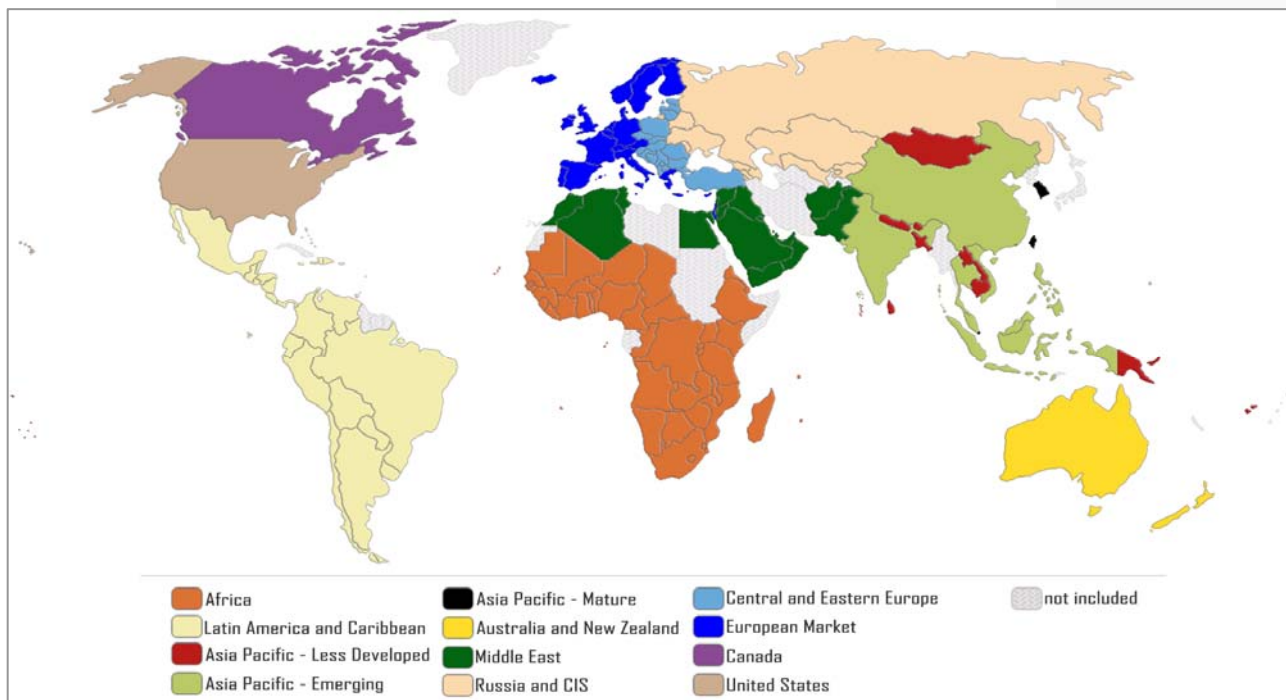
The CCNA courses are taught in more than 150 countries which are grouped into 12 regions (see Figure 1). Although Japan was one of these regions, it was not included in our analysis due to insufficient data. Australia and New Zealand were separated from the Asia Pacific - Mature region based upon language preferences and cultural differences. We also present data on Canada and the United States separately, because the United States data have been previously reported and may serve as a comparison for other regions. A list of the countries corresponding to the 12 regions included in this report is provided in Appendix 1.

Goal of this report is to identify students':

- Attributes
- Abilities
- Aspirations

Only students who took their course in English were included in this analysis.

FIGURE 1. Regions included in this report



The number of academies represented by the survey, the number of students responding to the survey, and the survey response rates are shown in Table 1. More than 50,000 students responded to the survey, representing more than 4,800 academies. Overall, the response rates were good, with about 14% of eligible students choosing to participate; response rates varied across regions from a high of 23% in the United States to a low of 9% in Asia Pacific – Emerging (which is acceptable for surveys of this kind).

The study has the normal limitations of survey research in that we can only report results for students who chose to participate in the survey. To check if the data collected were representative of the population, we compared known characteristics of the population (i.e., gender) to the survey data. The proportion of females in our survey data matched the proportion of females for seven regions and was under-represented in Africa, Latin America and Caribbean, Asia Pacific - Emerging, Middle East, and Russia and CIS regions. Reliable data for age and degree program levels were not available to make the comparison. Nonetheless, these response rates suggest that the survey data are reasonably representative of the student population.

Two regions, Asia Pacific - Less Developed and Russia and CIS, had the lowest number of students responding, but their response rates were still good. Nonetheless, because there are fewer students from fewer unique academies in these two regions, we recommend that data from these regions be used with care.

Worldwide more than 50,000 students were surveyed with 14% response rate across regions.

The survey data are reasonably representative of the student population.

TABLE 1. Number of academies, students, and response rates per 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 represented by the survey	103	175	29	404	131	155	113	51	341	987	158	2176	4823
Number of students who completed survey	2725	1839	519	7916	2720	1843	1210	349	3708	8230	1824	19,953	52,836
Survey Response Rate	22%	10%	17%	9%	11%	16%	14%	12%	16%	10%	20%	23%	14%

Note: Not all students answered all questions so the number of students included varies from table to table.

Student Gender and Age

The students enrolled in the CCNA1 course are predominantly male regardless of the region (see Table 2). The Russia and CIS region has the lowest percentage of female students (5%), while the Asia Pacific and Africa regions have the highest proportion of females (23% to 28%).

Overall, the average age of the students in the CCNA1 course is 25 years (see Table 2). There is some variation across regions, but the average does not change much across the regions. The lowest average age is about 22 in Asia Pacific - Emerging and Asia Pacific - Mature regions; the highest is 26 in the United States.

Table 2 also displays the percentage of students in three age ranges, which are the typical ages for high school students, college/university students, and older students. This breakdown of age range displays greater variation across regions. The largest proportion of students in all regions is in the 19-25 age range, except for the United States. Only 20% of the students in the United States were 19 to 25 years old; most were younger (41%) or older (39%).

Only a quarter of the students worldwide were 18 years and younger. Australia and New Zealand, Canada, and the United States have the highest percentage of 18 and under students (25% to 41%). Most of the other regions have a low proportion of young students, with the program concentrating on the typical college and university aged student.

One quarter of students worldwide are 18 and under.

TABLE 2. Student Gender and Age

	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	Average
Female	24%	16%	28%	23%	26%	11%	16%	5%	10%	9%	11%	15%	16%
Average Age	24.7	24.2	25.2	22.1	22.5	26.0	24.0	23.8	23.9	26.4	24.5	26.1	25.0
18 and under	4%	4%	2%	15%	19%	25%	4%	7%	11%	16%	31%	41%	25%
19 thru 25	63%	68%	67%	71%	65%	38%	75%	70%	62%	43%	39%	20%	43%
26 and older	33%	27%	30%	14%	16%	37%	21%	24%	27%	40%	31%	39%	32%

Student Current Educational Degree

Table 3 displays the current educational degree program in which students are enrolled. The “other” category is a combination of the students who reported their education level as associate, certificate, or non-degree. We believe students outside the United States and Canada may interpret these categories differently than what their peers would do in the United States and Canada. Consequently, the categories were collapsed to represent a broader and more inclusive category. Likewise, the term “high school” may have different meanings in different regions of the world (e.g., in England high school may refer to what the United States considers to be college).

Worldwide, about one quarter of the students are in high school settings, one quarter in bachelor degree programs, 6% in graduate programs, and 43% in other programs. Once again, there are some patterns and differences across regions.

About a quarter of the students are enrolled in a bachelor degree program, but this proportion varies from 10% in the United States to 56% in the Asia Pacific - Less Developed. The percentage of bachelor degree students in Asia Pacific - Less Developed, Asia Pacific - Emerging, and Middle East regions is considerably higher than the other regions (47% to 56%).

Overall, only 6% of the students are in graduate programs. The percentage of graduate students is relatively higher in Russia and CIS, and Central and Eastern Europe regions (17% and 19%, respectively) compared to the others.

The percentage of high school students differed across regions, varying from 5% to 38%. Consistent with Table 2, the United States had the highest percentage of high school students.

Students in Canada and the US had the lowest percentage of bachelor degree students.

The US had the highest percent of high school students.

TABLE 3. Student Current Educational Degree

	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	Average
High School	6%	21%	5%	20%	24%	17%	15%	30%	29%	22%	25%	38%	27%
Bachelor	39%	30%	56%	47%	17%	23%	49%	28%	26%	25%	14%	10%	24%
Graduate	4%	6%	11%	9%	6%	12%	13%	17%	19%	7%	2%	2%	6%
Other	51%	43%	28%	24%	53%	49%	23%	25%	26%	46%	59%	50%	43%

The differences in the students' distribution in the age and educational degree categories may be attributed to the diversity in student interests and availability of the program at different levels across region.

Student Employment

We also asked students if they had a full-time job. About 18 percent of students worldwide are employed full-time (see Table 4). The percentage of employed students differs from region to region and ranges from 6% to 29% across the regions. Students in Asia Pacific - Emerging, and Asia Pacific - Mature are less likely to be employed full time. Students in Asia Pacific - Less Developed and Russia and CIS are more likely to be employed full-time.

There are variations across regions in terms of full-time employment.

TABLE 4. Student Employment

	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	Average
Employed full time	18%	20%	27%	10%	6%	22%	12%	29%	24%	21%	13%	20%	18%

The CCNA program serves a large proportion of traditional students (high school, college, and university) who typically attend school full-time and are less likely to hold full-time jobs. About a third of the students across the regions are older, non-traditional students (see Table 2), so the program may have encouraged these students to stay in school or to return to school, rather than choosing to work full-time.

STUDENT SKILLS AND ABILITIES

We examined eight key skills and abilities of incoming students (see Table 5). Each skill and ability was assessed through 3 to 8 questions. These were self-reported questions that asked students to rate their own work abilities, learning abilities, and skills. In general, students rated themselves as very high in their work responsibility and confidence in their future career. They also viewed themselves as motivated and competent learners as well as problem solvers.

Interestingly, these ratings were high and showed very little variation across regions. There were two exceptions to this. First, students in the Asia Pacific - Mature region report their abilities and skills to be consistently lower than students from the other regions. For example, while the rating for work responsibility was 3.52 for the Asia Pacific - Mature region, the rating for the other regions ranged from 4.03 to 4.66. A possible reason for this is that the countries in the Asia Pacific -

Mature region have a very highly competitive education system. In contrast, students in Africa reported the highest abilities and skills, expect for technology skills.

The second exception to the consistently high ratings was in the area of technology skills. There was a wide variation in self reported technology skills, with Africa, Latin America and the Caribbean, and the Asia Pacific regions reporting lower skills (mean ratings ranging from 2.59 to 3.95) and the European, Canada, and Australia and New Zealand regions reporting the highest skills (ratings from 4.09 to 4.99). Interestingly, students in the United States self reported technology skills were below the average of the regions (3.82).

TABLE 5. Student Perceptions of Skills and Abilities

	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	Average
Work Abilities													
Work Responsibility	4.66	4.41	4.38	4.03	3.52	4.24	4.21	4.08	4.19	4.15	4.37	4.43	4.26
Career Self Efficacy	4.35	4.21	4.17	3.87	3.37	3.86	4.06	3.99	3.90	3.76	3.94	4.03	3.94
Learning Abilities													
Academic Self Esteem	4.22	3.98	4.11	3.85	3.38	3.72	3.93	3.86	3.83	3.68	3.68	3.81	3.80
Motivation for Learning	4.61	4.42	4.40	3.99	3.38	4.23	4.30	4.36	4.39	4.19	4.26	4.32	4.22
Lifelong Learning	4.34	4.35	4.26	3.95	3.53	4.11	4.14	4.10	4.15	4.03	4.19	4.28	4.14
Skills													
Technology Skills	2.93	3.95	3.67	3.24	2.59	4.26	4.09	4.99	4.82	4.47	4.33	3.82	3.85
Teamwork Skills	4.56	4.27	4.39	4.04	3.52	4.11	4.21	3.94	4.09	4.07	4.17	4.24	4.14
Problem Solving Skills	4.21	4.15	4.13	3.88	3.41	3.99	4.01	3.99	4.00	3.93	4.07	4.14	4.01

Note: Self-reported student ratings with a scales of 1 = low, 5 = high. Technology Skills used a scale of 0 = never performed the specified technology task, 6 = performed the task more than 5 times

The work abilities report how much students are responsible in their work environment and confident in their career abilities. These abilities were each based on a series of questions that used a scale of 1 being low and 5 being high. In general, students across regions felt that they were responsible at work and, to a lesser extent, confident in their

In general, students felt they were responsible at work and, to a lesser extent, confident in career abilities.

career abilities. Students in Africa, Latin America and Caribbean and Asia Pacific - Less Developed reported the highest work abilities, while students in the Asia Pacific – Emerging, Asia Pacific - Mature, Australia and New Zealand, and the European Market reported the lowest.

The learning abilities examine how much students are prepared for their academic courses, desire to learn, and want to continue to learn over their lifetime. These abilities were also each based on a series of questions that used a scale of 1 (low) to 5 (high). Across the regions, the students had a considerable desire for lifelong learning and motivation for learning, but only reported moderate levels of academic self esteem. Students in Africa, Latin America and Caribbean, and Asia Pacific - Less Developed reported the highest learning abilities. Students in the Asia Pacific - Emerging, Asia Pacific - Mature, and the European Market regions reported less than average learning abilities.

The skills section examined specific skills important to academic success, again with each skills measured by a set of questions. The teamwork and problem solving skills questions looked at how well students could collaborate in teams and solve problems, and used the same 1-5 point scale. The technology skills questions asked students how often they performed technology tasks such as installing an operating system, assembling computer and troubleshooting hardware or software problems. These questions used a different scale: 0 meaning never performed the task, 6 meaning performed the task more than 5 times. Across the regions, students were considerably skilled at problem solving and teamwork. Interestingly, students in less developed regions such as Africa, Latin America and the Caribbean, and Asia Pacific - Less Developed scored higher than the more developed regions on teamwork and problem solving skills, but not technology skills.

Overall, this pattern of student skills and abilities suggests that the CCNA program may be attracting the best and the brightest students in the developing regions and average students in the mature regions. The low scores on technology skills in developing regions are likely due to the lack of availability of technology and technology education programs through which students could have gained experience.

Students in developing regions scored higher than students in the more developed regions on most skills and abilities, except technology skills.

Students in the developing regions are more likely to be the best and brightest from their countries.

STUDENT ASPIRATIONS

Educational Aspirations

Consistent with the earlier reports based on students in the United States, CCNA1 students worldwide have high educational aspirations (see Table 6). Overall, most students intend to pursue additional education beyond the CCNA program, with almost half intending to complete a graduate degree. Students often hold higher aspirations

than they actually attain, so these aspirations may not reflect what students ultimately will achieve.

There are interesting differences among regions. Students in Asia Pacific - Mature, Australia and New Zealand, European Market, and Canada are not as interested in obtaining a graduate degree as are students in other regions. Instead, students in these regions are more likely to be seeking “other” degrees (i.e., a certificate, an associate degree, or no degree at all). Thus students in these more mature regions are pursuing degrees that are more closely tied to entry level networking careers.

Interestingly, students in the less developed regions are more likely to seek graduate degrees. Africa, for example, is the highest with 74% of students desiring graduate degrees, yet it has one of the lowest numbers of students who are currently enrolled in graduate programs. We noted earlier that students in the developing regions were more likely to report higher skills and abilities, so the fact that they also hold higher educational aspirations may not be surprising; if these are the best and brightest students from their countries, then we would expect them to hold higher than normal education aspirations. It may also be that the lack of plentiful technology jobs encourages students to stay in school longer, because there are fewer immediate job opportunities.

The opposite may be true for regions with mature economies. The availability of technology jobs coupled with the possibility that many students entering the program may not the “best and brightest” may lead to lower education aspirations. In the more mature regions, the program may be enabling lower skilled students to successfully enter a technology career that might not otherwise have been possible.

Students in developing regions have the highest educational aspirations.

TABLE 6. Educational Aspirations

Highest level of education intended	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	Average
High school diploma	3%	7%	3%	9%	14%	5%	7%	11%	11%	10%	4%	3%	7%
Bachelor's degree	14%	6%	14%	24%	24%	28%	12%	6%	8%	19%	26%	33%	24%
Graduate degree	74%	67%	71%	50%	29%	37%	67%	59%	61%	36%	29%	41%	45%
Other	10%	20%	12%	17%	32%	31%	13%	24%	20%	35%	41%	23%	24%

Career Aspirations

Worldwide, less than half of the students enrolled in the CCNA1 course intend to seek a career in networking (see Table 7). Another quarter of the entering students are seeking a career in IT, but not as a networking specialist (e.g., programming). The remaining one quarter of students are seeking careers not in networking or IT.

There is considerable variation across regions, although the most popular career choice for students in all regions is a network specialist (except for Asia Pacific - Mature where the most popular career is in IT other than networking at 29%). Students in Africa (58%), Asia Pacific - Less Developed (61%), Russia and CIS (60%), and Central and Eastern Europe (56%) show the greatest interest in networking careers, while students in Asia Pacific - Emerging (37%), and Asia Pacific - Mature (24%) show the least interest. Thus, even in the regions where networking careers are highly popular, about 40% of students are not seeking a networking career. Almost half of the Asia Pacific - Mature students have no intention of seeking careers related to networking or IT, preferring instead careers in business, as professionals, and elsewhere. Students in Asia Pacific - Mature, Australia and New Zealand and Canada are more likely to be seeking non-networking IT careers.

The most popular career choice for students is a network specialist.

Half of all students are **not** seeking a networking career.

TABLE 7. Career Aspirations

	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	Average
Networking specialist	58%	41%	61%	37%	24%	50%	51%	60%	56%	52%	45%	47%	46%
In Information Technology other than networking	25%	20%	15%	29%	29%	26%	14%	16%	23%	24%	28%	24%	25%
Professional (doctor, engineer, lawyer)	9%	29%	12%	14%	14%	7%	21%	14%	10%	9%	10%	9%	11%
In business other than Information Technology	3%	6%	5%	11%	17%	4%	4%	4%	5%	5%	4%	4%	6%
Teacher	1%	1%	3%	5%	9%	3%	5%	2%	1%	4%	2%	2%	3%
Other	4%	3%	5%	4%	7%	10%	6%	5%	5%	7%	12%	14%	9%

Another interesting observation is that professional careers (e.g., doctor, engineer, lawyer) are favored more by the students in the Latin America and Caribbean, and Middle East regions than by students in other regions. Across all regions, careers in teaching are the least preferred.

Reasons for Enrolling

The number one reason students gave for enrolling in the CCNA1 course, across all regions, is that they believed the course was important to their careers (see Table 8). Worldwide, about half the students enrolled for career reasons, but there is considerable variation across regions. About two-thirds of students in Africa, Latin America and the Caribbean, and Asia Pacific - Less Developed enrolled for career reasons, compared to less than a quarter in Asia Pacific - Mature.

The number one reason for students to enroll in the CCNA1 course is because it's important to students' careers.

TABLE 8. Reasons for Enrolling

	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	Average
The class is important to my career	66%	67%	67%	46%	23%	46%	59%	56%	53%	44%	40%	42%	46%
The class will help prepare me for my next degree	19%	10%	13%	19%	13%	14%	14%	21%	18%	11%	12%	15%	15%
The class sounded interesting	4%	10%	5%	11%	20%	12%	10%	7%	9%	14%	12%	15%	13%
The class is required	3%	9%	2%	7%	20%	12%	4%	4%	4%	13%	21%	9%	9%
I am not sure what career I want, but the class may help me decide	4%	1%	7%	8%	12%	11%	7%	7%	11%	7%	9%	11%	9%
My teacher or advisor recommended this class	2%	2%	1%	5%	9%	3%	4%	4%	2%	6%	2%	3%	4%
Other	3%	2%	4%	3%	4%	4%	4%	2%	3%	4%	4%	6%	4%

In most regions, the second most common reason for enrolling (reported by 10-21% of students) was because students believed that the course would help them prepare for their next degree, although in some regions the second most common reason (4-20% of students) was because students thought the class “sounded interesting”. Students in some regions also enrolled because the course was required by their degree program or because they thought it might help them choose a career.

As we have seen in the previous sections, there are again noticeable differences between the less developed regions and the more mature regions. In general, students in less developed regions tend to be more career focused and to have enrolled for career reasons, while students in more mature regions are more likely to have enrolled because they are sampling possible career options, reflecting, perhaps, the greater economic opportunities available in their regions.

STUDENT PROFILES

Common Student Profiles

We used statistical cluster analysis to identify different types of students in each region. We analyzed each region separately and found nine student profiles that re-appeared across the regions. Table 9 describes each profile in more detail. Note in the table, the word “primarily” is used to indicate regions in which 90% or more of the students exhibit this characteristic. The word “mostly” is used to indicate regions in which more than 50% of the students exhibit this characteristic. In some cases, characteristics differ by region, so both types are listed using the word “or”; for example, aspiring network specialists have high technology skills in some regions and moderately high technology skills in other regions.

The most frequently found student profile was the *Aspiring Network Specialist*. Aspiring network specialists have a career goal to become a network specialist and are enrolled in the CCNA program because they believe the program is important for their career. These students are exclusively males and have high (or moderately high) technology skills. A typical aspiring network specialist is between 23-26 years old, is not working, and is enrolled in a bachelor’s degree program or in an “other” degree program (i.e., associate, certificate or non-degree).

One might argue that providing a solid education for aspiring network specialists is a primary focus of the CCNA program. These students comprise only about one quarter of the total number of students enrolled, so it becomes interesting to consider who the remaining three quarters of students are.

Another common profile was the *Aspiring IT Specialist*. Aspiring IT specialists differ from aspiring network specialists in that their desired

The second most common reason to enroll was that the course would help students prepare for their next degree.

Students in developing regions tend to be more career-focused. Students in more developed regions are more likely to be sampling possible career options.

Aspiring Network Specialists comprise about 25% of the student population.

career goal is to work as an IT specialist, but not as a networking specialist. They too are enrolled in the CCNA program because they felt it is important to their future career in IT. These students are slightly younger (with a typical age of 22 or 23 years old) and are a mix of males and females (although mostly male, as is typical for the CCNA program in general). Likewise, most of these students are enrolled in bachelor degree programs and are either not working or mostly not working. Aspiring IT specialists are not as highly technology skilled as the aspiring network specialists. The IT specialists typically have average technology skills, with a couple of regions that were moderately high.

One region (Asia Pacific – Emerging) also had a student profile we called *Aspiring Business Professional*. The career goal for these students is to work in business (but not IT) or as a professional (e.g., doctor, engineer, lawyer). This group of students is similar to the Aspiring IT Specialists, except for their career goal. For example, the aspiring business professionals average 22 years of age, are mostly in bachelor degree programs, and have average technology skills. These students are also exclusively male and mostly not working. Their motivation for enrolling in the CCNA course is mixed, but most enroll because they think the CCNA program is important to their career or because it will help them in preparation for their next degree.

TABLE 9. Common Student Profiles

	Aspiring Network Specialist	Aspiring IT Specialist	Aspiring Business Professional	Career Oriented	Education Oriented	High School Student	Adult Learner	Working Student	Female Student
Typical Age Range	23-26	22-23	22	21-24	22-24	17-18	25-31	28-35	21-23
Gender	male	male and female	male	primarily male	primarily male	male	male and female	male and female	female
Degree Program	mostly bachelor and other	mostly bachelor	mostly bachelor	mixed	mixed	primarily high school	primarily other	primarily other	mostly bachelor and other
Technology Skills	high or moderately high	average or moderately high	average	average or moderately high	average	average	average to high	primarily high	primarily low
Career Goal	network	IT	mostly business and professional	network, IT, and professional	mostly network	mostly network and IT	mostly network	primarily network	mostly network and IT
Working	primarily not working	not or mostly not working	mostly not working	not or mostly not working	not or mostly not working	primarily not working	mixed	working	mostly not working
Enrollment Reasons	primarily career	mostly career	mixed	primarily or mostly career	mostly next degree	unsure, career, interesting	mixed	primarily or mostly career	mostly career, required, and next degree

The next two student profiles (*Education-Oriented* and *Career-Oriented*) were similar in many characteristics. Both profiles have students in a mix of degree programs, are predominantly males (more than 90%), and are either entirely not working or mostly not working. The typical age range is also very similar (22-24 and 21-24, respectively). Education-oriented students have average technology skills and a mix of career goals (mostly networking). Career-oriented students have average or moderately high technology skills with career goals split among networking, IT, and professional. The reason for enrolling in the CCNA1 course sets these student profiles apart. The education-oriented students enroll mostly to prepare for their next degree, while career-oriented students enroll predominantly (90%) or mostly (more than 50%) due to importance to their career.

Education-Oriented and *Career-Oriented* students are typical student profiles

The youngest group of students was in the *High School Student* profile. These students are typically 17 or 18 years of age and predominantly (90%) in high school (a few students in the “other” degree program were mixed in). They are also exclusively male, had average technology skills, are predominantly not working, and have both network and IT career goals. High school students typically enroll in the CCNA1 course because they are unsure about their career goals, because they believe the course is important for their career, or because the course sounded interesting.

The youngest students are in the *High School Student* profile.

An older group of *Adult Learners* was also found. These students are typically 25-31 years old, typically in the other degree program, and mostly males, as is typical of the program in general. Their technology skills range from average to high and they are mostly network career-oriented. These students are a mix of working and not working. They also have a mix of reasons for enrolling in the CCNA course, although, the majority responded that the CCNA1 course is important to their career.

The *Working Student* profile is similar to the *Adult Learner* profile, but includes only students who are working. These students are typically 28-35 years old. Similar to the *Adult Learner* students, working students are typically in the other degree program, mostly or predominantly males, and typically network career-oriented. Working students also have typically high technology skills and enroll in the CCNA1 course mostly or predominantly for career reasons.

The *Working Student* profile was similar to the *Adult Learner* profile but included only working students.

In six regions, the cluster analysis produced a *Female Student* cluster. As the name implies, these students are exclusively females. These students are young (typically 21-23 years old), mostly in a bachelor and other degree programs, and mostly not working. They are mostly seeking careers in networking, but some are seeking non-networking IT careers. These students choose to enroll in the CCNA1 course mostly for career purposes, but also because the course was required or it prepared them for their next degree. What is interesting about these students (besides that they were only females) is that their technology

The cluster analysis generated a *Female Student* cluster in six regions.

skills are typically low. This is the only student profile with low technology skills.

Distribution of Student Profiles Across Regions

Table 10 shows the regions and the percent of students placed into each student profile. On average, 24% of students globally were classified as an aspiring network specialist. Every region (except Asia Pacific - Mature) had this type of student, with 13% to 34% of students falling into this category. This is clearly an important set of students that the CCNA program attracts and likely retains as they are the most likely to continue on into other courses in the program. In the European Market, the aspiring network specialists were noticeably older than in other regions, ranging in age from 21-39.

Every region except Asia Pacific - Mature had aspiring network specialists.

TABLE 10. Percent of Students in Common Student Profiles Across Regions

	Africa	Latin America and 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
Aspiring Network Specialist	22%	19%	20%	23%*		30%	34%	34%	22%	15%	30%	13%
Aspiring IT Specialist	23%		16%				28%			21%		27%
Aspiring Business Professional				23%								
Adult Learner			28%		15%			42%		30%	22%	
Working Student	16%	17%				20%	13%		24%			28%
Career-Oriented		51%		31%	61%†		38%			22%		
Education-Oriented	15%		17%						33%	33%		19%
High School Student						22%		24%			21%	40%‡
Female Student	24%	13%	19%	23%	24%		15%					

* In the Asia Pacific - Emerging region, the analysis combined the Aspiring Network and IT Specialist profiles into one cluster.

† In the Asia Pacific - Mature region, the cluster analysis further decomposed the Career-oriented profile into two sub-groups: one with students in high school, bachelor degree programs, and graduate programs; and one with students only in other degree programs.

‡ In the United States, the cluster analysis further decomposed the High School Student profile into two sub-groups: one with students who were interested in IT or networking careers and one with students interested in business, professional and other careers.

The aspiring IT specialist was found in five regions and accounting for 16-28% of students in those regions. In one region (Asia Pacific - Emerging), the cluster analysis combined aspiring network specialists and aspiring IT specialists into the same profile. These two profiles, as well as the Aspiring Business Professional, are quite similar, differentiated primarily by their career objectives.

The next two profiles are adult learners and working students. Every region has *either* adult learners or working students (except Asia Pacific - Emerging). Adult learners emerged in five regions and comprised 15-42% of students in those regions, while working students were found in six out of the 12 regions, and comprised 13-28% of the students. As this suggests, the two profiles are somewhat similar, with the key differentiators being whether they are working or not, their career goals, and enrollment reasons. Working students are focused on a networking career and have enrolled for that reason. Some adult learners are also highly focused on a networking career and have enrolled for that reason, but as a group, adult learners are less networking career-focused than the working students. Thus as a group, adult learners are more likely to be interested in an *education*, rather than networking *training*.

The next two profiles, education-oriented and career-oriented students also have some similarities. Education-oriented students were seen in five regions and comprised 15-33% of students in those regions. Career-oriented students were found in five regions and comprised 22-61% of students in those regions. Most regions had either type of these students, although some had both. What set these two profiles apart was the reason the students choose to enroll in CCNA1: education-oriented students were focused on getting an additional degree while career-oriented students were focused on getting a networking career. In the United States, the education-oriented students were noticeably older than in other regions, ranging in age from 17-39. In the Asia Pacific - Mature region, the cluster analysis further sub-divided the career-oriented profile into two sub-groups based on the student's degree program. That is, one sub-group had students in high schools, bachelor degree programs, and graduate programs; while the other sub-group had students exclusively in other degree programs (i.e., associate, certificate, and non-degree).

The high school student profile was seen in four regions (Australia and New Zealand, Russia and CIS, Canada, and the United States) and comprised 21-40% of students in those regions. The key point is that in these four regions, high school students were distinctly different from the other types of students so much that they were separated into their own profile. In the other eight regions (e.g., European Market), high school students were integrated into the other profiles (usually education-oriented and career-oriented, but occasionally aspiring network specialist, aspiring IT specialist, and aspiring business professional). Thus, the high school students in these four regions are

Every region, except Asia Pacific - Emerging, has either adult learners or working students.

High school students were distinctly different from other types of students in only four regions.

different from other CCNA1 students and from high school students in other regions. In the United States, the high school profile was further subdivided into two sub-groups based on career goal. That is, there was one sub-group of high school students that were IT and network career goal oriented and a second high school sub-group that was predominantly not IT, nor network career goal oriented. This latter sub-group had low technology skills.

The same can be said for the female student profile, found in six regions (Africa, Latin America and Caribbean, the three Asia Pacific regions, and the Middle East). In these six regions, the female students were so distinctly different from their male counterparts that they were grouped together. In contrast, female students were integrated into the other clusters along with their male colleagues in the other six regions (Australia and New Zealand, Russia and CIS, Central and Eastern Europe, European Market, Canada, and the United States). In these six regions, female students comprised 13-24% of the students.

Across almost all regions, there is a core group of college and university students focused on networking careers. Five regions also had a group of university students with broader career goals – to work in IT, but outside of networking. Likewise, in almost all regions there is a group of older adult and/or working students who have returned for more education (usually a certificate, an associate's degree) in hopes of obtaining a networking or IT career. Most regions also have a set of more traditional career-oriented and education-oriented students who are enrolled in high school, college, university and non-traditional settings. Some regions (Australia and New Zealand, Canada, and United States) have large populations of young students in high school settings, who are distinctly different from students in colleges, universities and non-traditional settings, while other regions have fewer of these students, who are more likely to be similar to other students in the region. Other regions (Africa, Latin America and Caribbean, the three Asia Pacific regions, and the Middle East) have female students that are distinctly different from their male counterparts, while female students in other regions are more likely to be similar to male students in those regions.

CONCLUSION

The Academy program serves many different types of students, who have different career aspirations and who have enrolled for a variety of reasons. One goal of the CCNA program is to provide networking education based on the needs of networking professionals and the requirements of the Cisco CCNA certification exam. Yet, only half of the students enrolled in the CCNA1 course plan to work in networking. Another quarter of the students are interested in pursuing an IT career, other than a networking career. The remaining quarter of the students are not interested in either networking or other IT careers. It is clear that

In six regions, the female students were so distinctly different from their male counterparts that they were grouped together.

There is a core group of college and university students focused on networking careers.

the program currently serves multiple constituencies. Thus it is important to understand who the current students are, and why they are enrolled, before deciding what groups of students the program *should* be designed to serve.

There are a number of striking commonalities and differences across the regions. Two commonalities across regions are the students' career aspirations and reasons for enrolling. Only about half of all students (sometime less) are seeking a career in networking. Another one quarter are seeking IT careers beyond networking, with the remainder seeking careers outside of IT. Nonetheless, most students in all regions have chosen to enroll in the CCNA1 course because they believe it is important to their career.

Across all regions, there is a core group of traditional college-aged students (aged 19-25). This group forms the majority of students in the developing regions, but accounts for only one fifth to one half of students in mature regions, which have higher proportions of both younger and older students. The program is popular at the bachelor's level in some regions, at the high school level in others, and at certificate, associate and non-degree programs in others. The highest female participation rates are in the developing regions. There is high variation in employment across the regions, with the rate of employed students as high as 29% in some regions. Based on student self-reports, the program appears to attract the best and the brightest students with the highest educational aspirations in the developing regions, and average students with more moderate educational aspirations in the developed world.

Students in Asia Pacific - Mature region were quite different in their responses to most of the survey from other students in other regions. For example, they had lower opinions of their skills and abilities and did not have a group of aspiring network specialists. Interestingly, instructors in this region also had markedly different opinions than instructors from other regions (see WP-06-03). This suggests that further investigation may be warranted to understand these differences.

The program has important regional differences, but also some commonalities.

Only half of the students enrolled in the CCNA1 course plan to work in networking.

Students in Asia Pacific - Mature region were quite different in their responses to most of the survey from other students in other regions.

Implications for Program Redesign

We see at least six implications for re-designing the program. Some of these address curriculum issues, while others consider program implementation issues.

First and foremost, the program serves many different types of students with different goals. The current program is designed to attract and educate students who aspire to become network specialists; yet only half of all CCNA1 students (25-60% depending upon the region) plan to enroll in the entire program and become network specialists. The remaining 50-75% of students, who do not seek to become network specialists, is an important constituency whose needs may not be well

It is important to consider not only the level of the student (i.e., high school, college, university) but also the students' goals.

served by the current program. Thus, in redesigning the program, it is important to consider not only the level of the student (i.e., high school, college, university) but also the students' goals. We believe that the goal of the first CCNA course should remain to provide a basic introduction to networking concepts for students. This course should be designed with an awareness that a significant number of students do not intend to pursue further networking education. Alternately, the program may choose to significantly reduce its current size to focus more narrowly on the core group of aspiring network specialist by explicitly choosing not to meet the needs of other students.

Second, half of all students are not interested in a networking career and most of those who are interested in a networking career intend to pursue additional education beyond the CCNA program before entering the workforce. Thus, most students in CCNA1 are seeking more than *training* in the latest technologies. Instead, they are seeking an *education* in networking and technology concepts that will serve them in their future careers in networking, IT, business, and elsewhere, and also prepare them for more education. It is important to these students that the CCNA program continues to provide a high quality education, not just network training. These students are seeking a solid conceptual foundation, not training on the use of the current network hardware and software that will evolve before they enter the job market. They also need professional skills beyond the technology itself; skills such as reading, writing, speaking, teamwork, and problem solving.

Third, high school students in the United States, Canada, and Australia and New Zealand (and to a lesser extent, Russia and CIS) are different from other students enrolled in the CCNA1 course. As a group, they are younger and less mature, have average technology skills, and are less certain about a career in networking. It could be useful to design a high school version of the program for students in these regions, whose background, skills, and aspirations are so different from the other students in the program. If a high school version of the CCNA program is developed, it might only be needed in English. Our analysis separated high school students from other CCNA students only in the United States, Canada, Australia and New Zealand, and Russia and CIS, which are English-speaking countries (with the exception of Russia and CIS). A high school version of the program might not be needed in other languages, because there were few differences between high school students and other students in non-English speaking regions. The caveat, of course, is that we studied only English speaking students and thus, our sample may not be representative of non-English speakers in these other regions.

Fourth, female students in developing regions were different from male students in those regions. These female students were mostly in colleges, universities, and non-traditional settings, and typically fit the traditional pattern for such students: aged 21-23 and not working. Unlike all other types of students, they typically had low technology

Students need professional education not technology training.

High school students in the United States, Canada, and Australia and New Zealand are different from other students.

Female students in developing regions are different from male students in those regions and could benefit from more technology education prior to enrolling in the CCNA program.

skills. We believe that this calls for systemic regional plans to attract, develop, and retain female students in developing regions. This includes plans designed to identify and meet the unique needs of female students, such as their low technology skills. For example, it might be important to advise or require female students to take IT Essentials prior to enrolling in the CCNA program.

Such plans targeted at female students may also be useful in mature regions, but female students in mature regions who are *currently* enrolled are more likely to have similar interests and needs as their male counterparts, and thus may have their needs met by the same program initiatives that meet the needs of male students.

The developing regions have a much higher proportion of female students than in the mature regions. This suggests that the mature regions may be able to learn from the experiences of the developing regions and create programs that are more successful in attracting female students.

Fifth, students in the developing regions tend to be the best and brightest students in those regions, while students in the mature regions are more likely to be average students from their regions. Thus, the recruiting processes used in different regions may need to be different, reflecting the unique nature of their students. It might also be useful to track the placement and impact of students in developing regions, as these students may have a noticeable impact. As the program expands in the developing regions, the student profile may evolve to become more similar to that in the mature regions.

Finally, students in some regions and some profiles had lower skills and abilities, especially lower technology skills which have been shown to be important in student success. This suggests that the program and/or managers in these regions may want to develop ways to systematically identify and advise these students and provide ways to upgrade their skills either prior to, or concurrently with, their enrollment in the CCNA program (e.g., the IT Essentials course). Finding and supporting these students will increase the likelihood that they will succeed and continue with other CCNA courses.

Students in the developing regions are more likely to be the best and brightest from those regions.

Develop ways to systematically identify students with low technology skills and provide ways to upgrade their skills.

APPENDIX

Appendix 1: Countries by Regions

Africa			
Angola	Benin	Botswana	Burkina Faso
Burundi	Cameroon	Cape Verde	Central African Republic
Chad	Congo, Republic of The	Congo, The Democratic Republic of The	Cote D'ivoire
Djibouti	Eritrea	Ethiopia	Gambia
Ghana	Guinea-bissau	Guinea	Kenya
Lesotho	Liberia	Madagascar	Malawi
Mali	Mauritania	Mauritius	Mozambique
Namibia	Niger	Nigeria	Reunion
Rwanda	Sao Tome and Principe	Senegal	Seychelles
Sierra Leone	South Africa	St. Helena	Swaziland
Tanzania, United Republic of	Togo	Uganda	Zambia
Zimbabwe			
Latin America and the Caribbean			
Argentina	Bahamas	Barbados	Belize
Bolivia	Brazil	Chile	Colombia
Costa Rica	Dominican Republic	Ecuador	El Salvador
Guatemala	Haiti	Honduras	Jamaica
Mexico	Nicaragua	Panama	Paraguay
Peru	Puerto Rico	Trinidad and Tobago	Uruguay
Venezuela			

Asia Pacific - Less Developed			
Bangladesh	Bhutan	Cambodia	Fiji
French Polynesia	Lao People's Democratic Republic	Maldives	Mongolia
Nepal	Papua New Guinea	Samoa	Sri Lanka
Asia Pacific - Emerging			
China	India	Indonesia	Macau
Malaysia	Philippines	Thailand	Vietnam
Asia Pacific -Mature			
Hong Kong	Korea, Republic of	Singapore	Taiwan
Australia and New Zealand			
Australia	New Zealand		
Middle East			
Afghanistan	Algeria	Bahrain	Egypt
Iraq	Jordan	Kuwait	Lebanon
Morocco	Oman	Pakistan	Qatar
Saudi Arabia	Syrian Arab Republic	Tunisia	United Arab Emirates
West Bank/Gaza	Yemen		
Russia and CIS			
Armenia	Azerbaijan	Belarus	Georgia
Kazakhstan	Kyrgyzstan	Moldova, Republic of	Russian Federation
Ukraine	Uzbekistan		

Central and Eastern Europe			
Albania	Bosnia and Herzegovina	Bulgaria	Croatia
Czech Republic	Estonia	Hungary	Kosovo
Latvia	Lithuania	Macedonia	Poland
Romania	Serbia and Montenegro	Slovakia (Slovak Republic)	Slovenia
Turkey			
European Market			
Andorra	Austria	Belgium	Cyprus
Denmark	Finland	France	Germany
Greece	Iceland	Ireland	Israel
Italy	Luxembourg	Malta	Netherlands
Norway	Portugal	Spain	Sweden
Switzerland	United Kingdom		
Canada			
Canada			
United States			
American Samoa	Guam	United States	