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# CCNA3 Student Experiences Survey Report

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## **PREFACE**

This Technical Report is one in a series of reports that examines the student practices and student engagement 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](http://www.indiana.edu/~iuteam)).

This Technical Report is an addendum to the CCNA2 Student Experiences Survey Report (TR-06-03) which presented a detailed view of the key findings of student practices and student engagement. We presume that the reader is familiar with the Cisco Networking Academy and the CCNA program.

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[www.ciscolearning.org](http://www.ciscolearning.org)

## Executive Summary

The purpose of this technical report is to describe findings from the Cisco Certified Network Associate (CCNA) Program Student Experiences Survey administered to CCNA3 students and to provide the recommendations that arise from those findings. This paper does address five things. It describes the CCNA students in terms of demographics, explores the most important elements in the CCNA program that impact student learning, determines the elements that most need improvement, discusses student practices in and out of the classroom, and broadly examines student engagement. This paper also explores students' perceptions about whether the CCNA program approach can and should be applied in other educational settings. The conclusion of this paper will offer recommendations for the CCNA program based on insights from the CCNA3 students.

The CCNA Student Experience Survey was developed by following rigorous validation procedures to ensure reliability and validity. The survey was administered to all active CCNA3 students starting in January 2005 and continuing until April 2006. We received responses from 9,563 students, of which 3,418 were students in the United States (U.S.) (which represents 14.0 % of all active CCNA3 students in the U.S.). This report focuses only on the students from the United States.

The analyses in this report are based primarily on responses from CCNA3 students, about half of which were from students in community college (CC) and one third from high school (HS) students. The remainder of the sample consisted of students' enrollments in four-year postsecondary institutions (4-year) and non-traditional institutions. Females comprise a small portion of the sample, only 10.7% in HS and about 16.1% in colleges.

A large portion of the full-time students in this analysis were working in areas related to their education; the percentage ranges from 28% for college students to 48% for non-traditional students.

The course length differed for high school and postsecondary students. Most HS students (81%) reported enrollment in a course that spans one term or most of one term (at least 13 weeks). In contrast, around 40% of community college students are enrolled in half-term courses (5-8 weeks). Another third of the community college students are enrolled in semester length courses and about 20% in courses taken over one quarter. The compression or expansion of the courses may be an important consideration in evaluating students' reported effort and time spent, especially relative to other courses.

The overall results suggest that students value the quality of the CCNA program. Students evaluated the curriculum materials and the teaching practices. In all cases, the majority of the students are positive about the curriculum. The labs were rated as the most important to their learning with lectures and online readings as the second most valuable. The students reported putting high levels of effort into the course and spending a considerable amount of time on the CCNA3 course relative to other courses. Moreover, students reported a strong support for adopting the Cisco curriculum model in their science and math classes in the regular school curriculum.

The CCNA3 course is primarily a hands-on, laboratory course. However, students spend almost as much time in lecture as they do in the lab. Interestingly, they spend more time reading than anything else. Analyses of the time spent on course activities showed that reading consumes about 30% of the time they spend on the course. Students reported

spending very little time working in groups outside of class and they report low levels of classroom participation and low levels of interaction with the instructor.

Overall, engagement in learning as reflected in classroom participation, interacting with the instructor, and cognitive effort in their CCNA3 course was significantly higher than the comparison courses and national norms with small to large effect sizes.

High school students, as compared to college students, viewed classroom discussions as more important to their learning and the hardcopy text as less important. Overall, the high school students rated the learning resources lower than did college students.

There are two overall conclusions for the CCNA3 course that may be taken from these findings. First, it seems the CCNA curriculum is one which is well designed that challenges students but also one which they appreciate. This holds true across demographic categories of students. Finally, the findings suggest that training of instructors, and high school instructors in particular, in pedagogical strategies related to active learning should be developed and classes and instructors should be evaluated in terms of engagement.

# SECTION 1

## INTRODUCTION

This report evaluates the third course (CCNA3) in the Cisco Certified Networking Academy program. The evaluation examined CCNA3 along four dimensions: 1) the student evaluations of the overall Cisco model; 2) what components of the curriculum are most and least helpful to their learning; 3) how students spend their time in the course; and 4) the degree to which students are actively engaged in the learning process. Student data were collected through a survey administered over the Web to CCNA3 students. This report incorporates all data collected through April 1, 2006.

### 1.1 Student Engagement in CCNA3

We examined three aspects of student's self-reported engagement: active participation in class, the amount of effort spent on the class, and student interaction with the instructor outside of the classroom. We sought to determine if students were more engaged in their CCNA3 course than in their other courses (science, math, or computer technology courses). The engagement items in our CCNA3 student experiences survey were adapted from the National Survey of Student Engagement (NSSE, <http://www.indiana.edu/~nsse>) thus providing the opportunity to compare the CCNA3 students to national norms.

We examined student engagement because research has found it to be one of the strongest correlations between student learning and student retention. Pedagogical theory and some experimental studies further suggest its causal impact on learning and retention. Besides being an important factor in learning, we were interested in engagement because it is something that can be modified in the instructional context. If student engagement predicts performance, the success of students can be increased through modifications in instructional approaches. That is to say, instructional approaches can be developed that can more effectively engage students (with perhaps different strategies for different students) ultimately leading towards better performance.

### 1.2 Best Practices and Opportunities for Improvement

We sought to understand what students perceived to be the most important learning activities as well as the best and the least effective teaching practices and resources. We asked similar questions to instructors. Therefore, in this report we compare student perceptions of valuable activities and resources to instructor perceptions.

### 1.3 Types of Learning Activities

As part of the analysis of best practices, we collected student reports of how they spend their time working on the CCNA3 course. While we did not ask what is most valuable, the types of activities can be related to successful performance of the student and the academy.

### 1.4. The CCNA Instructional Model

The CCNA program presents a different and theoretically interesting curriculum model involving centralized development and distribution of curriculum assessments with local control in teaching. The student and instructor materials, including assessments, are centrally developed and made available online. However, the course is taught in the classroom by local instructors who may modify curriculum to meet local needs and to use all

but the final test in anyway they wish (e.g., as an instructional tool rather than an assessment device).

We sought to understand whether students felt they learned more under this model than in traditional classes, and if the model is one that should be applied more generally, e.g., in their science and math classes.

## **SECTION 2 METHODS**

This section describes the target population, as well as the development, administration, and analysis of the CCNA3 survey. A copy of the survey is included in Appendix A. Most of the sub-sections in this methods section were described in Technical Report 06-03, because the surveys and administration of data collection were very similar. Additionally, student engagement in learning was previously reported in White Papers (WP-05-03 and WP-05-05).

### **2.1 Participants of the CCNA3 Survey**

Participants were students in the United States who were enrolled in the CCNA3 course during the survey administration period (January 2005 through April 2006). The survey was accessible from the CCNA program homepage to all CCNA3 students worldwide who had finished at least 50% of the course. An alert appeared on the students' homepage notifying them about the availability of the online survey. One email was also sent by Cisco Learning Institute to every CCNA3 student asking them to participate in the survey. An additional email was sent to students in American academies who had completed a survey in the previous course and provided us their personal email address.

We took further steps to increase the survey return rate for 292 academies in the United States that were part of a more detailed comparison study. (More details about the comparison study can be found in Status Reports I, II, and III). We sent three additional email reminders to course instructors in these comparison academies if their academy participation rate had not yet reached expected levels during the preceding time period. We also sent electronic monthly newsletters to all of the comparison group instructors to update them about the study and survey participation rates.

A potential of 23,469 students could have responded to the survey. A total of 3,418 students responded, yielding a response rate of 14.0%.

### **2.2 The CCNA3 Survey**

The CCNA3 Student Survey consisted of 53 questions with 50 rating scale items and 3 open-ended questions. On average, it took 9 minutes for students to complete the survey. Several attitudinal and perceptual constructs were assessed in the survey: Personal and Educational Growth, Growth in Future Career and Educational Plans, Student-Faculty Interaction, Active Participation in Class, and Cognitive Effort. Additionally, the survey asked students about: the course components that help learning, components that need improvement, average time spent in course activities; and whether course methods should be used in other classes. Finally, the following demographics were collected: school level, course length, employment, and enrollment in other courses. The subsequent sections describe the survey items used for each factor and the demographic questions.

### **2.3 Predictor Variables**

#### **2.3.1 Student Engagement**

Student engagement is defined as the time and effort students spend both during and outside of the classroom in educationally sound activities. Three constructs were used to

index engagement: Active Participation in Class, Interaction with the Instructor, and amount of Cognitive Effort. The engagement items were adapted from the National Survey of Student Engagement (NSSE) (Kuh, 2001).

The NSSE items were modified to reference the appropriate school type (high school or college). Also, while NSSE asks students about their engagement overall during the prior year, we modified the questions to refer to their experiences in CCNA3 and another course in which they were enrolled. By asking the same questions about the two courses, we could evaluate the relative engagement of students in CCNA3.

We identified the comparison class by first asking students to identify the courses in which they were concurrently enrolled. Based on students' responses to the question about enrollment in other classes, questions in the survey were modified to reference a particular class they were enrolled in, with the preference being in the order shown in the left side of Table 1. We wanted to have high school students compare CCNA3 to another course that had a laboratory element, was highly analytical and oriented toward problem solving yet was part of the normal high school curriculum. Thus, if a student was enrolled in a science class, that class became the reference regardless of the other courses. Computer technology and math courses became the next two alternatives to be referenced if not enrolled in a science course.

**TABLE 1. Priority order of comparison courses**

High School	Postsecondary and Non-traditional
1. Science	1. Computer Technology
2. Computer Technology	2. Science
3. Math/Statistics	3. Math/Statistics
4. Business	4. Business
5. History/Social Studies	5. History/Social Studies
6. English	6. English

For postsecondary students, the primary comparison sought was with other computer technology courses not taught within the Cisco Academy framework. Preferences after that are shown in the right half of Table 1. As the student answered the question about current enrollment, the items in the survey changed dynamically to insert the appropriate subject area in the comparison questions.

If a student was not enrolled in any other courses, then he or she was asked to think about the last science or math course (high school) or computer course (postsecondary) he or she was enrolled in. However, only data for students concurrently enrolled in science, computer technology, or math courses were included in the analyses involving comparisons.

Thirteen items were used to assess the three engagement constructs as follows:

- a. *Student-Faculty Interaction*: Three Likert scale items related to student-faculty interaction made up this category with a four-point scale (Very Often, Often, Sometimes, Never). The Cronbach alpha for the construct was .812. Items asked if the student talked about future education plans or career plans with a teacher or an assistant, and whether he or she received prompt written or oral feedback. In the CCNA2 survey we had three more items for this construct. Since CCNA3 is close to

the end of the program, the items selected for this survey are more relevant to whether students obtained educational and career guidance from their CCNA instructors.

- b. *Active Participation*: Four Likert scale items related to active participation made up this construct with a four-point scale (Very Often, Often, Sometimes, Never). The Cronbach alpha for the construct was .640. The items inquired as to whether students asked questions in class or contributed to class discussions, worked with other students in groups during class, worked with other students in groups outside of class, and discussed ideas from their class with others outside of class (students, family members, co-workers, etc.).
- c. *Cognitive Effort*: Five Likert scale items formed this category with a four-point scale (Very Much, Quite A Bit, Some, Very Little). The Cronbach alpha for the construct was .752. The items asked students if they worked harder than they had anticipated to meet the teachers' standards or expectations; memorized facts, ideas, or methods; understood information and its meaning; applied what they learned to practical problems or new situations; and created new, more complex interpretations and relationships by combining ideas and information in new ways.

### **2.3.2 Level of academic challenge**

One item asked about the level of challenge students felt in their CCNA3 course. A parallel item asked about the challenge they felt in the comparison course (see Table 1). The challenge was rated on a five-point scale from Very Much to Very Little.

### **2.3.3 Evaluation of course components**

One item asked students to rate the educational value of each component of the course. Those components were online readings and examples, hardcopy textbooks, tests and quizzes, classroom lectures, classroom discussions, and lab activities. An open-ended question then asked students to explain their choice. A parallel set of questions asked students about the components of the course they felt needed to be improved upon followed with an open-ended item to explain the reason.

### **2.3.4 Average time spent for CCNA3 course activities**

Students were asked to report the number of hours they spent during an average week in various activities for CCNA3. These activities included listening to teacher lectures, participating in class discussions, participating in labs, working on projects outside of class, reading online materials, reading other materials, and working in groups outside of class. Students could choose 0 to 8 hours for each activity.

### **2.3.5 Beliefs about using CCNA3 course methods in other courses**

After students reported their engagement in the CCNA3 and comparison courses, students were asked about their level of agreement with a seven-point Likert scale item whether other courses should be taught the same way CCNA classes are taught. Students were then asked to explain the reasoning behind their choice.

### **2.3.6 Demographics**

Certain academy characteristics and student demographics may contribute differently to student engagement. Therefore, the following demographic items were obtained:

- a. *Student school information:* The Cisco Learning Institute provided records indicating the type of building in which the course was offered in: high school, 2-year postsecondary, 4-year postsecondary, or adult education center. We also asked students their current school type (high school, full-time college/university, part-time college/university, or other). These two sources of data were used to determine the school. Students were also asked whether or not they took their CCNA1 course in their current school/institution.
- b. *Enrollment status:* Student reported if they were enrolled full or part-time.
- c. *Course information:* Students reported the number of students in their CCNA2 course and the length of their course (4 weeks, 5-8 weeks, 9-12 weeks, 13-16 weeks, or more than 17 weeks).
- d. *Student employment:* Students reported their employment status (i.e., not working, working related to their education, or working unrelated to their education).
- e. *Per capita income in the neighborhood:* The zip codes of academies were provided by CLI in the demographics file. We looked at the 2000 United States Census Data set to identify the per capita income in the neighborhoods.

### **2.4 Outcome Measures**

Data on three outcome measures were obtained. Two measures were constructs related to student growth while the third was performance on the final test in the course.

#### **2.4.1 Personal and educational growth**

Six Likert scale items made up this category with a four-point scale (Very Much, Quite A Bit, Some, Very Little). The Cronbach alpha for the construct was .839. Students were asked about the extent to which their experience in the CCNA3 course and comparison courses contributed to their growth in the skills of: writing, speaking, critical thinking, working effectively with others, solving real-world problems, and learning effectively on their own.

#### **2.4.2 Career and future education plan**

Three Likert scale items made up this category with a four-point scale (Very Much, Quite A Bit, Some, Very Little). The Cronbach alpha for the construct was .793. Items included acquiring career or work-related knowledge and skills, developing clearer career goals, and preparing for future education.

### **2.5 Development of the CCNA3 Student Experiences Survey**

The CCNA3 Survey includes the same items as the CCNA2 Survey; both surveys measure student engagement and experiences in corresponding courses. While developing the CCNA3 Survey, we monitored the completion rates for each question in the initial stages of the CCNA2 Survey. Based on the analysis of the data, the CCNA3 Survey was shortened and its layout was altered slightly in order to encourage the highest rates of participation possible. Four items that have low impact on the engagement scale were removed from the

CCNA3 Survey. Two questions about the most important learning method were converted into open-ended items. An item asking about time spent on Cisco and a comparable course was simplified. After these changes, in order to keep the pages visually consistent, the order of questions was changed. One question with eleven items on page two was moved to page three and questions with a fewer number of items were moved to the top of the page two.

## 2.6 Administration of the CCNA3 Student Experiences Survey

After developing and revising the items in the CCNA3 survey, the IU Evaluation Team conducted usability tests. These tests included accessing the survey on different computer platforms and with different browsers, and determining if the collected data matched the submitted data. These steps were taken to assure smooth implementation of the survey. The Cisco Learning Institute put the survey online which was accessible from students' CCNA homepage. Data collection began on January 20, 2005 and ended on April 1, 2006.

## 2.7 Data Cleaning and Preparation of the CCNA3 Student Experiences Survey

After data collection, invalid student responses were identified and removed from the data set. First, we examined cases where respondents spent less than 3 minutes to complete the survey from login to logout as recorded from the web server (9 minutes was the average time to complete the survey). For the 232 students who fit this criterion, we looked for response bias in their responses to the Likert items making up the six constructs. We found 115 cases where the respondents gave the same answer to a sequence of 19 items. These cases were removed from the analyses.

## 2.8 Participants and Participation Rates of the Student Experiences Survey

The nature of the CCNA program allows instructors to determine the start date and length of a course based on the context of their institution. We analyzed the survey return rates based on reported course start and end dates. Using the student demographic file, we identified all students who could have accessed the CCNA3 Survey by putting the start and end date of the survey as cutoff points for students who passed 50% of the course length. This gave us the target population of the CCNA3 Survey. We then analyzed survey responses to eliminate non-eligible and mostly incomplete cases and the ratio between these numbers gave the participation rate. All of the academies in the US were coded into four categories: high schools, community colleges, university/college, and non-traditional. In Table 2, community colleges and universities are combined and referred to as postsecondary institutions. Table 2 provides the response rates for the survey.

**TABLE 2. CCNA3 Student Experiences Survey responses**

Institution Types	Target population	Number of Completed Surveys
High School	6,296	1,011 (16.1%)
Postsecondary	16,205	2,061 (12.7%)
Non-traditional	1,098	231 (21.0%)
Total	23,599	3,303 (14.0%)

## SECTION 3 RESULTS

In this section, we first provide a description of the students in the sample and the courses taken. We look at the student’s evaluation of the CCNA3 course – what is working and what is not. We next look at how students work in the CCNA3 course; that is, how much time they spend and what do they do in and out of class. We then turn to student engagement, asking about the degree and nature of the students’ engagement in the learning process. Finally, we turn to the evaluation of learning and look at this in two ways. We examine the student’s own judgment of their personal growth and their measured growth in basic skills.

### 3.1 Student and Course Characteristics

#### 3.1.1 Program of study and gender

In the CCNA3 survey, we asked students if they were part-time or full-time students. We also asked them if they were in a high school or college program, but sought to verify their responses to this question by also looking at the classification of the institution they attended. The classification of students using these two criteria was performed as follows:

*Participants reporting that they are high school students:* If these students were attending a high school, they were classified as high school. If they were not attending a high school they were classified as non-traditional.

*Participants reporting they are college/university students:* If these students were attending a two-year degree granting institution, they were classified as community college. If they were attending a four-year degree granting institution, they were classified as college/university. The remainder of this group, those not attending a degree granting institution, was classified as non-traditional.

*Participants reporting they are part of a non-traditional institution.* These students were classified as non-traditional.

The majority of the students were male; this was true regardless of the type of institution or whether they were attending full- or part-time institution. As shown in Table 3, high schools and community colleges have the highest proportion of male students.

**TABLE 3. CCNA3 gender distribution**

	High School	Full-time Community College	Part-time Community College	Full-time University	Part-time University	Non-Traditional
Male	90.1% (898)	82.1% (686)	85.7% (659)	84.6% (148)	71.9% (46)	81.4% (315)
Female	9.9% (99)	17.9% (150)	14.3% (110)	15.4% (27)	28.1% (18)	18.6% (72)
Total	997	836	769	175	64	387

Table 3 also shows that the enrollments in community college were split evenly between full- and part-time students, 836 and 769 respectively. (Please also note that some students do not answer all questions, hence the total number changes slightly from table to table.) There were far fewer students attending four-year institutions; these students accounted for only 13% of the postsecondary enrollments. There was also a tendency for a lower portion of part-time students in the four-year institutions, with only 27% part-time enrollment.

### 3.1.2 Employment status

As shown in Table 4, about 88% of part-time college students reported working while attending school. In comparison, about 66% of college students (both those in community colleges and four-year universities), 79% of non-traditional students, and 56% of high school students are working. We were surprised with the high percentage of full-time students, both high school and college, who are working. Importantly, over 50% of the part-time students and 48% of the students in non-traditional programs are working in areas relevant to their education. We would expect the CCNA3 course to have increased relevance for these students. In contrast, only 28% of full-time college students and 14% of high school students are working in an area related to their education. Thus, overall, we would expect part-time students to perform at a higher level than full-time students.

**TABLE 4. CCNA3 student work status**

	High School	Full-time Community College	Part-time Community College	Full-time University	Part-time University	Non-Traditional
Not working	43.8% (449)	34.3% (293)	12.2% (95)	33.7% (60)	12.5% (8)	20.9% (83)
Working related to education	14.2% (145)	28.1% (240)	50.8% (396)	30.3% (54)	42.2% (27)	48.0% (191)
Working not related to education	42.0% (430)	37.7% (322)	37.0% (288)	36.0% (64)	45.3% (29)	31.2% (124)
Total	1024	855	779	178	64	398

### 3.1.3 Course students referenced in making comparisons

Our sample may also be defined in terms of the course students referenced in comparing the CCNA3 course to their other course experience. When asking students to compare their CCNA3 experience to their experiences in another course we wanted them to reference a course they were taking the same semester as CCNA3. Further, if they were taking multiple courses, we defined a preference as to which course they referenced (see Table 1). Thus, once students identified the courses in which they were enrolled, the survey questions were modified to identify a particular subject based on the priorities in Table 1. If the student was not enrolled in any other classes, they were asked to reference their last computer class (postsecondary and non-traditional) or science class (high school).

As indicated in Table 5, the majority (56.9%) of the high school students took a science course concurrently with CCNA3, hence the science course served as their reference in comparing CCNA3 to other courses. In contrast, the vast majority (88.6%) of college students who were taking another course also took a computer technology course that was

not part of the CCNA program. However, 30.6% of the college students were only taking one course (CCNA3), consistent with the high percentage of part-time college students in our sample.

**TABLE 5. Selected comparison course**

Comparison Course	High School	Post-Secondary	Non-Traditional
Science	584	37	8
Computer Technology	159	1154	59
Math/Statistics	133	41	5
Business	26	31	7
History/Social Studies	63	22	2
English	27	18	2
No other class	35	574	316

In comparing students' ratings of the CCNA3 course to their "other" course, we only considered those students who had taken a science, math, or computer course. We did this because we wanted to compare CCNA3 to a course that was likely to have a laboratory and which emphasized analytic and problem-solving skills. Because students who were not taking one of these courses concurrently with CCNA3 were excluded, most part-time postsecondary students were not included in the comparison analysis, since they were generally only taking one course during the semester.

### **3.1.4 Length of the CCNA3 course**

Each CCNA course is designed to be delivered over one semester. However, academies have the freedom to compress or expand the period of delivery. Many postsecondary institutions tend to offer two courses in one semester, while some high schools on a block schedule (i.e., longer meeting times) can do the same compression. The courses are also adapted to fit quarter systems, trimesters, and high school terms. Reports from instructors suggest that they adjust to the time allotted by spending more or less time on topics or by adding or removing topics or exercises. It should be noted, however, that regardless of the time period over which the course is offered, all students take the same final exam.

We asked students how long their course was using the scale below. While they were only given the following length options, the list below provides our interpretation of each length.

*4 weeks or less:* The shortest period a CCNA course can be offered; sometimes done as an intensive workshop.

*5-8 weeks:* Generally in community colleges and universities, two CCNA courses are offered in a semester. Each is offered in a half-semester.

*9-12 weeks:* This group includes students who are in a trimester schedule or a quarter system.

*13-16 weeks:* This group includes students who are in a semester schedule for colleges and universities.

*17 weeks or more:* For high schools, a semester is usually around 20 weeks.

Table 6 displays the distribution of the CCNA3 course length indicated by the students. Most of the high school students (53.1%) took CCNA3 over a typical high school term, i.e., over more than 17 weeks. In contrast, community college students were most likely to either take two CCNA courses a semester (5-8 weeks for a course or one trimester) or one course a semester (13-16 weeks); whereas, university students were more likely to take one course a semester (13-16 weeks) or a quarter (9-12 weeks).

**TABLE 6. CCNA3 course lengths**

	High School	Full-time Community College	Part-time Community College	Full-time University	Part-time University	Non-Traditional
4 weeks or less	3.0% (31)	4.1% (35)	6.2% (48)	5.1% (9)	4.7% (3)	9.5% (38)
5-8 weeks	4.8% (49)	37.1% (318)	40.6% (316)	29.8% (53)	35.9% (23)	31.8% (127)
9-12 weeks	11.2% (115)	20.7% (177)	18.5% (144)	22.5% (40)	25.0% (16)	20.3% (81)
13-16	27.9% (287)	31.4% (269)	26.0% (202)	40.4% (72)	25.0% (25)	12.0% (48)
17 weeks or more	53.1% (545)	6.7% (57)	8.7% (68)	2.2% (4)	9.1% (6)	26.3% (105)
Total	1027	856	778	178	64	399

### 3.2 Student Evaluation of the CCNA3 Curriculum and Program

#### 3.2.1 Student evaluation of resources and instruction

Students were asked to rate the importance of the six CCNA program components as they aided in their learning. The percentage of students giving the two highest ratings (very or somewhat important) on a five-point Likert scale is shown in Table 7. An examination of Table 7 indicates that the labs were rated as important or very important to their learning, with almost 90% concurrence from college and non-traditional students. This is not surprising because the lab exercises are the key hands-on activity in a very applied subject matter.

What stands out in Table 7 is that with one exception, a strong majority of the students rate all of the resources as important. The one exception is that few high school students (30.3%) rate the hardcopy text as important. Although the hardcopy text is rated lower than the other resources by all three groups of students, this may reflect a greater difficulty in reading comprehension of the text for the high school students. Given the reports of errors in the hardcopy text and the reported delays in receiving updated versions of the textbooks, it is surprising that so many college and non-traditional students rated the hardcopy text so highly. The other explanation for high school students overwhelmingly selecting online readings instead of hardcopy textbooks is that they are the Internet generation and prefer online reading to reading from a textbook.

Another trend in the data is that high school students tend to give a lower rate of importance universally to all instructional resources than the ratings of college and non-traditional

students. It is hard to make sense of this finding; it may simply be that the lower ratings reflect the teenage years where everything seems to be inadequate.

An examination of Table 7 also shows that a large proportion of participants rate the labs as more important than any of the other resources. The laboratory exercises are an essential activity in an applied subject matter, one which is crucial in a context where hands-on labs are not very common.

Our analysis of gender differences indicate that across all categories of resources, the percentage of female students who perceive instructional resources as important is five to ten percentage points higher than those for male students. This is true regardless of school type.

**TABLE 7. Students rating instructional resources and approaches as important**

	High School	Postsecondary	Non-Traditional
Lab activities	78.7% (807)	89.2% (1671)	88.2% (351)
Classroom lectures	69.1% (710)	83.0% (1552)	80.5% (32)
Classroom discussions	71.5% (734)	82.5% (1545)	81.5% (325)
Online readings and examples	74.6% (766)	84.6% (1585)	86.2% (343)
Hardcopy textbooks	30.3% (311)	67.1% (1256)	73.2% (292)
Tests and quizzes	71.2% (731)	84.1% (1573)	86.4% (344)

In a separate study (TR-06-02), instructors were asked to rate the importance of the various resources to student learning. As seen in Table 8, over 80% of instructors rate all but the hardcopy textbook as very important. In essence, there is an agreement between instructors and students that the package of materials, excluding the textbook, is important to learning. In contrast to the students, the high school instructor ratings are similar to the ratings of the other instructors. This suggests the student effect could be a reflection of the teenage perspective.

**TABLE 8. Instructors rating each instructional resource as important**

Curriculum and Resources	High School	Postsecondary	Non-Traditional
Online reading materials	83.9%	83.5%	87.5%
Hardcopy textbooks	39.8%	58.2%	46.2%
Hands-on lab activities	88.9%	90.3%	89.2%
Online tests and quizzes	83.5%	77.1%	78.4%
Simulations and e-labs	88.2%	80.3%	76.9%

We sought to obtain greater differentiation of the importance of the resources by asking students to identify the resource that most needs improvement. That is, only one resource

could be identified as most in need of improvement. We find that the online readings, hard copy textbook, and the tests and quizzes are seen as those which most need improvement (see Table 9). Furthermore, the focus on need for improvement for all students tends to be on the curriculum materials rather than the instruction. The lectures and classroom discussion received the fewest votes for need of improvement.

In addition to these overall trends, there is an interesting contrast between high school students and the other students as shown in Table 9. A larger proportion of college and non-traditional students (22%) than high school students (17.5%) identified the lab activities as needing improvement. In contrast, a higher proportion of high school students (26.5%) than college (17.9%) and non-traditional students (16.4%) rated the online readings as most in need of improvement. We suspect that the high school students see the readings as a greater problem because they have difficulty with the reading level of the text and are more dependent on text-based learning. Moreover, high school students prefer reading online, and they want the errors to be fixed as reported in the earlier report. In contrast, college students will be better readers and, being older, are also more focused on learning through application. Thus we may expect them to be more sensitive to the quality of the labs in support of their comprehension.

**TABLE 9. Instructional resources or approaches most needing improvement**

	<b>High School</b>	<b>Postsecondary</b>	<b>Non-Traditional</b>
Lab activities	17.5% (179)	21.8% (405)	23.5% (93)
Classroom lectures	8.2% (84)	8.7% (161)	14.4% (57)
Classroom discussions	6.2% (64)	4.7% (88)	4.5% (18)
Online readings and examples	26.5% (272)	17.9% (331)	16.4% (65)
Hardcopy textbooks	17.7% (181)	25.5% (473)	19.7% (78)
Tests and quizzes	23.9% (245)	21.4% (396)	21.5% (85)

### **3.2.2 Should other courses be taught the same way as CCNA?**

While students have complaints, in general they find the CCNA3 curriculum materials to be very useful. In this next set of questions, we sought the students' overall evaluation of the CCNA pedagogical strategy. If this is a good way to learn, then we would expect them to want to use this same approach in their other courses. Therefore, we asked students whether other courses such as mathematics and science should be taught the same way (using online materials, online tests, and hands-on labs) as CCNA courses, and the reasoning behind their choice. We used mathematics and science as the reference because we wanted students to think about traditional courses in the curriculum that were also problem-solving and lab oriented.

The responses were strongly positive: 76.3% of postsecondary and 74.8% of non-traditional students thought that other courses should be taught the same way as CCNA. The high school students are slightly less convinced (69.4%) than the other students. There was no differentiation between male and female responses. Approximately 12% of high school and postsecondary students are undecided about this question.

**TABLE 10. Should other courses be taught the same way as Cisco courses?**

	High School	Postsecondary	Non-Traditional
Agree	69.4% (713)	76.3% (1429)	74.8% (297)
Neither Agree or Disagree	11.1% (114)	12.9% (241)	15.9% (63)
Disagree	19.5% (200)	10.8% (202)	9.3% (37)

### 3.3 Student Time Allocation in CCNA3

#### 3.3.1 Time spent on different learning activities in the CCNA3 course

We sought to understand how students spend their time working on their course -- what happens in and out of class. We provided students with a list of activities and asked them to indicate the number of hours they spent on each activity during a typical week. While we report estimated hours in Table 11, our focus in the analysis is the proportion of time spent on the different activities which may be expected to be less impacted by the length of time in which the course is offered (See Table 6).

Perhaps most surprising is the proportion of time that students reported spending reading. Regardless of degree program or whether or not the student is full-time, about 30% of the work on the course is spent reading. This compares to approximately 20% of the time spent in labs, i.e., the students report spending 50% more time reading than they do working on laboratory exercises. Clearly, reading is the dominant learning activity, involving not only more time than labs, but also more time than lectures, group discussions, or projects. Clearly, the quality of the text materials and the reading skills of the students should be a major consideration in the design of the course – at all academic levels.

Other findings in Table 11 also helping us understand the learning activities of students include:

- ☒ Lecture and laboratory time are balanced for all academic levels, with the lecture time taking up slightly less time than the labs.
- ☒ Very little time is spent working in groups outside of class – it is almost exclusively individual efforts. This is surprising since we would expect the complex materials and labs to naturally foster study groups.
- ☒ Projects to be done outside of class are considerably less common for high school students. High school students spend only about two-thirds of the time as students in all other academic levels working on projects outside of class.

- ☒ Across academic levels, on average, students reported spending 10% to 14% of their total course time in group discussion. High school students spend more time in this endeavor – for every hour of lecture, they spend three-fourths of an hour in group discussion. This compares to about .6 of an hour of dialogue for all other academic groups. This is surprising since many students reported that there were not enough class discussions. The conflict would suggest that there is considerable variability across academies or instructors in the utilization of group discussion as a pedagogical strategy.

**TABLE 11. CCNA3 students' time spent on various learning activities**

	<b>High School (N=1027)</b>	<b>Full-time Community College (N=856)</b>	<b>Part-time Community College (N=779)</b>	<b>Full-time four year institution (N=178)</b>	<b>Part-time four year institution (N=64)</b>	<b>Non- Traditional (N=399)</b>
<b>In Class* Percentage (Hours Spent)</b>	<b>51.9%</b> (6.9 hrs)	<b>49.4%</b> (8.5 hrs)	<b>47.1%</b> (8.1 hrs)	<b>48.6%</b> (8.4 hrs)	<b>44.8%</b> (7.3 hrs)	<b>46.5%</b> (8.7 hrs)
Listening to teacher lectures	18.0%	18.0%	16.9%	17.9%	16.0%	16.6%
Participating in class discussions	14.3%	11.6%	9.9%	9.8%	8.6%	10.2%
Participating in labs	19.5%	19.8%	20.3%	20.8%	20.2%	19.8%
<b>Reading (in or out of class) Percentage (hours spent)</b>	<b>31.6%</b> (4.2 hrs)	<b>29.1%</b> (5.0hrs)	<b>31.4%</b> (5.4 hrs)	<b>28.9%</b> (5.0 hrs)	<b>33.7%</b> (5.5 hrs)	<b>33.2%</b> (6.2 hrs)
Reading online materials on your own	23.3%	16.9%	18.6%	17.3%	20.9%	19.8%
Reading other materials (such as books, manuals etc.)	8.3%	12.2%	12.8%	11.6%	12.9%	13.4%
<b>Out of Class* Percentage (Hours Spent)</b>	<b>16.5%</b> (2.2 hrs)	<b>21.5%</b> (3.7 hrs)	<b>21.5%</b> (3.7 hrs)	<b>22.5%</b> (3.9 hrs)	<b>21.5%</b> (3.5 hrs)	<b>20.3%</b> (3.8 hrs)
Working on projects outside of class on your own	10.5%	15.7%	16.9%	15.6%	16.0%	15.0%
Working in groups outside of class	6.0%	5.8%	4.7%	6.9%	5.5%	5.3%
<b>Total Hours Spent</b>	<b>13.3 hrs</b>	<b>17.2 hrs</b>	<b>17.2 hrs</b>	<b>17.3 hrs</b>	<b>16.3 hrs</b>	<b>18.7 hrs</b>

\* We are unable to determine the proportion of reading that occurred in and out of class. Therefore, estimates of in and out of class time do not include time spent reading.

### 3.3.2 Time spent on the CCNA3 course compared to other courses

The data in the previous section tells us how much time students believe they spend on CCNA3; here we seek to compare those estimates to their experiences in other classes, asking if they are working harder in CCNA3 than they are in their science, math, and other computer courses. Students were asked to compare the time they spent in an average week for the CCNA3 course to another course they were enrolled in that semester. In this analysis, we only looked at students who were taking a science, math, or computer course the same semester as their enrollment in CCNA3.

As indicated in Table 12, over half of the postsecondary students and nearly 42% of the high school students reported spending more time on CCNA3 than on their comparison course (science, computer technology, or mathematics/statistics). If we look at the percentage of students saying they spent more time on CCNA3 to those saying they spent more time on the comparison course, the ratio is close to 4:3 for high school students and 6:1 for postsecondary students.

**TABLE 12. Reported time in average week in CCNA3 and other courses (science, technology, or math)**

	High School	Postsecondary
Approximately the same amount of time	21.2% (186)	27.2% (335)
More time on CCNA	41.9% (367)	58.7% (723)
More time on other course	33.3% (292)	12.5% (155)
Not applicable	3.5% (31)	1.4% (17)

### 3.4 Student Engagement in Learning

Academic engagement of learners is widely considered to be a good predictor of student retention and success for degree and certificate programs. In general, academic engagement in the classroom refers to the degree to which the student is actively involved in the learning process. This includes the amount of effort or work they put into the course, their degree of participation in the class through questions and discussion, and their interaction with the instructor. Outside of the classroom, we asked a series of questions around the three engagement constructs: Active Participation, Interaction with the Instructor, and Cognitive Effort. There were 4, 3, and 5 questions, respectively, for each construct with alpha internal consistency scores of .640, .812, and .752.

In all of the analyses in this section, we limited the data to those students who reported taking a science, computer technology, or math/statistics course concurrently with CCNA3. All other respondents were excluded. We did not separate postsecondary students into part-time and full-time students, because most of the part-time students were not taking any other courses and thus, would not be included in the analysis. We also explored interactions with gender. We only present gender data when significant effects were identified.

### 3.4.1 How challenged are the students in the CCNA3 course?

Students were asked to rate on a four-point scale how challenged they were by the CCNA3 course. In order to get a sense of the degree of difficulty, we also asked students to rate the challenge they faced in the comparison course they were taking that term. In Table 13, we combined the very little and the somewhat challenged categories when reflecting the student percentages. For both high school and postsecondary students, the CCNA3 course was seen as much more challenging. The difference between the CCNA3 and the comparison courses was highly significant. While 46.5% of the high school students felt very challenged in CCNA3, only 24.7% felt the same way about their comparison course. In the postsecondary level, the difference was even larger with 73.9% finding the CCNA3 course very challenging but only 28.5% finding their other comparison course very challenging.

A potential moderating variable here is the length of the CCNA3 course. The more compressed the course (see Table 6) the more challenging the course would likely be. This may explain why the high school students do not feel as challenged as the postsecondary students where the course they take is typically offered in a quarter or semester timeframe.

**TABLE 13. How Challenging are the CCNA3 and Comparison Courses**

Academy	Courses	Little or Some Challenged	Quite a bit Challenged	Very Much Challenged	Average Rating	Cohen d Effect size
High School (N=867)	CCNA2 Course	9.7%	43.8%	46.5%	3.31	.72 (Large)
	Science, Computer Technology, Math	39.1%	36.2%	24.7%	2.64	
Postsecondary (N=1221)	CCNA2 Course	2.7%	23.4%	73.9%	3.69	.97 (Large)
	Science, Computer Technology, Math	22.2%	49.2%	28.5%	2.93	

\* 4.0 indicates very challenging

### 3.4.2 Student Engagement in CCNA3

Tables 14 and 15 show the students' reported levels of engagement in learning in CCNA3 and the comparison science, math, or computer class. Engagement in this study was indexed by ratings on three constructs: Active Participation, Interaction with the Instructor, and Cognitive Effort.

Looking first at the high school students (Table 14), we find that students in the CCNA3 courses reported significantly higher levels of classroom participation, interaction with the instructor, and active participation with medium effect sizes. Moreover, in levels of cognitive effort; students in CCNA3 reported almost one and a half times more for high level of effort in CCNA3 than in the comparison course. The percentages of high active participation and high interaction with instructor are not as high as cognitive effort. This suggests that CCNA3 course is more individually focused, consistent with earlier report that they spent less time in groups.

**TABLE 14. High school students' engagement in the CCNA3 and science, technology, or math/statistics courses**

Engagement	Course	Low	Medium	High	Average Rating	Cohen d Effect size
Active Participation (N= 876)	CCNA3 Course	26.8%	55.8%	17.4%	2.54	.34 (Medium)
	Science, Computer Technology, Math	41.5%	45.8%	12.7%	2.32	
Interaction with Instructor (N= 876)	CCNA3 Course	40.9%	36.1%	23.1%	2.49	.66 (Medium)
	Science, Computer Technology, Math	69.2%	21.1%	9.7%	1.93	
Cognitive Effort (N= 876)	CCNA3 Course	11.1%	42.8%	46.1%	2.97	.40 (Medium)
	Science, Computer Technology, Math	21.9%	48.5%	29.6%	2.69	

4.0 indicates "very high." Low indicates average score between 1 and 2, medium indicates between 2 and 3, and high indicates more than 3.

Turning now to the college students, we find similar results in Table 15. We find that students in postsecondary institutes also spend significantly more time in active participation, interaction with faculty, and cognitive effort in CCNA3 than their comparison course. Again, more students report high levels of cognitive effort. The CCNA3 course demands considerably more effort than the comparison course.

**TABLE 15. Postsecondary education students' engagement in the CCNA3 and science, technology, or math/statistics courses for**

Engagement	Course	Low	Medium	High	Average Rating	Cohen d Effect size
Active Participation (N= 1232)	CCNA3 Course	19.2%	57.3%	23.5%	2.68	.48 (Medium)
	Science, Computer Technology, Math	38.4%	47.9%	13.7%	2.37	
Interaction with Instructor (N= 1232)	CCNA3 Course	42.6%	36.2%	21.2%	2.46	.34 (Medium)
	Science, Computer Technology, Math	56.4%	30.9%	12.8%	2.18	
Cognitive Effort (N= 1232)	CCNA3 Course	5.7%	45.8%	48.5%	3.09	.43 (Medium)
	Science, Computer Technology, Math	14.7%	52.1%	33.2%	2.82	

\* 4.0 indicates "very high." Low indicates average score between 1 and 2, medium indicates between 2 and 3, and high indicates more than 3.

We now move from a discussion of the level of engagement in school to the question of whether CCNA3 results in greater engagement than the comparison course. We analyzed the variation in ratings of the CCNA3 and comparison courses for each engagement variable for high school and postsecondary students. All of the differences yielded a

statistically significant discrepancy indicating that by all measures, students are more engaged in CCNA3 than in the comparison course. Similar to analyses previously done in this report, we used Cohen's d to also assess the practical significance of the differences.

In order to better understand the level of engagement of our survey participants, we compared the engagement ratings of the high school, community college, and university students in CCNA and comparison course to the ratings of students who completed the High School Survey of Student Engagement (HSSSE), the Community College Survey of Student Engagement (CCSSE), and the National Survey of Student Engagement (NSSE), respectively shown in the Norm Students column. Table 16 shows that CCNA3 student interaction with the instructor was significantly greater than the norm for all three groups, with medium and large effect sizes. Thus, the interaction of the instructor with our students is considerably higher than that reported by the norm group. Since the two items in this construct are related to future career and education, students in CCNA3 have a high level of interaction with their instructors related to their future education and career plans.

Cognitive Effort was also significantly greater for both university and community college CCNA students; though, the effect was more so for the university students. Only in the community college was cognitive effort for the comparison course greater than the national norms (CCSSE). Surprisingly, the effect of cognitive effort was at small effect size for the high school students.

**TABLE 16. Engagement of CCNA3 Students in CCNA and Comparison Course with Norm Students**

Academy	Engagement	CCNA3 Course	Science Technology Math	Norm Students	Effect size Cohen's d
High School	Active Participation (N=876)	2.54	2.32	2.45	Not Significant
	Interaction with Instructor (N=876)	2.49	1.93	1.84	.75 (Large)
	Cognitive Effort (N=876)	2.97	2.69	2.82	.23 (Small)
Community College	Active Participation (N=1038)	2.68	2.36	2.48	.31 (Medium)
	Interaction with Instructor (N=1038)	2.46	2.17	2.05	.5 (Medium)
	Cognitive Effort (N=1038)	3.09	2.81	2.66	.73 (Large)
University Students	Active Participation (N=194)	2.66	2.41	2.61	Not Significant
	Interaction with Instructor (N=194)	2.40	2.19	2.12	.33 (Medium)
	Cognitive Effort (N=194)	3.06	2.84	2.89	.27 (Small)

\* 4.0 indicates "very high"

The comparison of CCNA3 engagement to the norms for student engagement does not fully replicate the findings based on the comparison to student engagement in the CCNA3 course. However, the overall conclusions remain the same: students are more engaged in CCNA3 with small to large effect sizes.

### 3.5 Student Success

In this final section, we look at the success of the students in the CCNA3 course. The goal of the CCNA program, in addition to fostering technical knowledge, is to support the development of the student. In this section, we describe students' reported growth in two areas. One series of questions asked about students' growth in basic skills such as writing, problem solving, speaking, and working in groups. There were 6 items asked as part of the Basic Skills construct, which had a Chronbach's alpha internal consistency value of .839. The second reported growth area deals with planning for the future. Here, we asked students if the course experience aided them in developing or evaluating their career or educational plans. This Plan for the Future construct consisted of three items with a Chronbach's alpha of .793.

#### 3.5.1 Reported growth in basic skills and planning for the future

Students were asked to what extent the experience from the CCNA3 and comparison courses contributed to personal and educational growth and to planning for their career and educational future. High school students reported significantly more development in Basic Skills and in their Planning for the Future as a function of the CCNA3 course than from their comparison course (see Table 17). In terms of practical significance, the effect sizes are medium to large, one-half for Basic Skills and more than two-thirds of a standard deviation for Planning for Future. Indeed, as we might expect, almost half of the students reported that the CCNA3 course contributed to a high growth in their planning for the future – more than twice as many who said the science course was of high value.

**TABLE 17. Growth in the CCNA3 and science, technology, or math/statistics courses for high school students**

Growth	Course	Low Percent	Medium Percent	High Percent	Average Rating	Cohen d Effect size
Basic Skills (N=876)	CCNA3 Course	17.8%	49.9%	32.3%	2.77	.54 (Medium)
	Science, Computer Technology, Math	27.6%	58.0%	14.3%	2.43	
Plan for Future (N=876)	CCNA3 Course	17.0%	36.2%	46.8%	3.04	.70 (Large)
	Science, Computer Technology, Math	40.8%	36.5%	22.7%	2.44	

\* 4.0 indicates "very high". Low indicates average score between 1 and 2, medium indicates between 2 and 3, and high indicates more than 3.

As we turn to the postsecondary students (see Table 18), we see the same high percentage of students saying that the CCNA3 course resulted in a high growth in their Basic Skills (36.0% vs. 32.3% in high school) and in Plan for the Future (47.9% vs. 46.8% for high school). However, as might be expected, students in college are more focused on planning

for the future and taking courses that are more relevant to their goals. Thus, we find that a high percentage of the postsecondary students also report a high level of growth in Basic Skills and Planning for the Future. As a consequence, the differences between the courses are smaller with lesser effect size in the growth in Planning for the Future.

**TABLE 18. Growth in the CCNA3 and science, technology, or math/statistics courses for postsecondary students**

Growth	Course	Low Percent	Medium Percent	High Percent	Average Rating	Cohen d Effect size
Basic Skills (N=1232)	CCNA3 Course	16.2%	47.8%	36.0%	2.84	.51 (Medium)
	Science, Computer Technology, Math	23.1%	59.6%	17.3%	2.52	
Plan for Future (N=1232)	CCNA3 Course	15.4%	36.6%	47.9%	3.07	.31 (Medium)
	Science, Computer Technology, Math	24.4%	41.4%	34.2%	2.83	

\* 4.0 indicates "very high". Low indicates average score between 1 and 2, medium indicates between 2 and 3, and high indicates more than 3.

## **SECTION 4**

### **CONCLUSION and IMPLICATIONS**

This report provides an analysis of the students enrolling in CCNA3, the experiences they had in the course, and their evaluation of those experiences. The analyses in this report are based primarily on CCNA3 survey responses provided by 3,418 students, about half of whom were in community college (CC) and one third in high schools (HS). The remainder of the sample consisted of enrollments in four-year postsecondary (4-year) and non-traditional institutions. Females remain a small portion of the sample, only 10.7% in high school and about 16.1% in colleges.

The demographic data suggests that a large portion of the students, even those going to school full-time, are working in areas related to their education – with the percentage ranging from 28% to 48% for college and non-traditional students. Thus, we would assume that for these students the CCNA3 course is career relevant and that they should be motivated to succeed. Additionally, in addition to the course lab work, these students are likely to have a real world context to think about in terms of the application of the concepts learned.

Most high school students (81%) report being enrolled in a course that runs the whole term or most of a term (at least 13 weeks). In contrast, around 40% of community college students are enrolled in half term courses (5-8 weeks), with another third in semester courses and about 20% in courses taken over a quarter. The compression or expansion of the courses may be an important consideration in evaluating students' reported effort and time spent, especially relative to other courses.

Overall, the results provide strong support for the quality and value of the program. This held true for the evaluation of the curriculum materials, the teaching practices, and the interactions with the instructor. In all cases, the majority of the students are positive about the curriculum. They rate the labs as most important to their learning with lectures and online readings as next most valuable.

Perhaps most interestingly, the students report putting in a high level of effort and spending a considerable amount of time on the course relative to other courses. Nonetheless, they indicate strong support for adopting the Cisco curriculum model (online curriculum and testing, local teaching, applications in laboratories and online simulations) for science and math classes in the regular school curriculum. It is certainly nice to see students advocating a program that causes them to work hard and contains difficult concepts. This speaks very well to the curriculum design and overall strategy.

While we have thought of the CCNA3 as primarily a hands-on, laboratory course, students spend almost as much time in lecture as they do in the laboratory --- and they spend more time reading than anything else. Indeed, reading consumes about 30% of the time they spend on the course. Working in the course seems to be primarily a solo endeavor. Students report spending very little time working in groups outside of class and they report low levels of classroom participation and low levels of interaction with the instructor. Moreover, the students report a smaller portion of the total time they spend on the course (10% to 14%) to classroom discussion.


Overall, engagement in learning as reflected in classroom participation, in interacting with the instructor, and cognitive effort in CCNA3 was significantly higher than the comparison courses and national norms.

High school students, as compared to college students, view classroom discussions as more important to their learning and the hardcopy text as less important. Overall, the high school students rate the learning resources lower than do college students but this would seem to reflect a general teenage negativism. The high school students report spending less time per week on the course than do college students, with college students spending 30% more time per week. However, this may simply reflect the faster pace in which college students cover more material because of the tendency to offer two courses per semester in college. Overall we found very similar results between genders, except that males were a little less satisfied with the curriculum than females.

There are two overall characterizations of the CCNA3 course that we would take from these findings. First, it seems to be a well designed curriculum that challenges students but one which they also appreciate. This holds true across demographic categories of students. Thus, the findings suggest that training of instructors, and high school instructors in particular, in pedagogical strategies related to active learning should be developed and classes and instructors should be evaluated in terms of engagement.

# Appendix A: CCNA3 Student Experiences Survey

## CCNA3 Survey – Part 1



Survey

**CCNA3 Student Experiences Survey**

The purpose of this study is to understand what helps you learn in Cisco courses, and what makes a class interesting and useful. The information that you provide will help us to improve the courses.

**Part 1 of 3**  
**Experiences in your Cisco classes**

**Directions:** In this section please think about your Cisco class and what is most important and why it is most important.

1. Which of the following best characterizes your enrollment status at this institution this academic term?

High School

Full time College/University

Part time College/University

Other

2. Check all the classes you are currently taking this academic term:

Science

Computer Technology (Other than Cisco Course)

Math/Statistics

Business

History/Social Studies

English

No classes other than CCNA3

3. How important are each of the following in helping you learn in CCNA3?

	Very Important 1	Somewhat Important 2	Neither Important nor Unimportant 3	Somewhat Unimportant 4	Very Unimportant 5
a. Online readings and examples	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Tests and quizzes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Classroom lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Classroom discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Lab activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Hardcopy text books	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3.1 Please explain your ratings for question 3.

4. Which of the following **most** needs improvement in CCNA3?

a. Online readings and examples

b. Tests and quizzes

c. Classroom lectures

d. Classroom discussions

e. Lab activities

f. Hardcopy text books

4.1 Why? Please explain your choice for question 4.

5. In an **average** week, **about** how many hours do you spend on the following activities for your CCNA3 class?

## CCNA3 Survey – Section 1 (continued)

a. Listening to teacher lectures	Select One ▾
b. Participating in class discussions	Select One ▾
c. Participating in labs	Select One ▾
d. Working on projects outside of class on your own	Select One ▾
e. Reading Cisco online materials	Select One ▾
f. Reading other materials (such as books, manuals, etc.)	Select One ▾
g. Working in groups outside of class	Select One ▾
<b>h. Total hours</b>	0 hours

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# CCNA3 Survey – Part 2



Survey

## CCNA3 Student Experiences Survey

### Part 2 of 3

#### Experiences in your courses this semester

Directions: The questions in this section ask about the experiences you have had in your courses this semester. Answer the following questions by checking the response that best matches your level of agreement with each statement.

	I spent much more time on my Cisco class 1	2	3	The same time on both 4	5	6	I spent much more time on my Science class 7	N/A
1. In an average week <i>this term</i> , did you spend more time outside of class on your Cisco class or your Science class?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. To what extent do you feel challenged in your Cisco class and your Science class?

	Very Much	Some	Little	Very Little	N/A
a. Cisco	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly Agree 1	Agree 2	Slightly Agree 3	Neither Agree nor Disagree 4	Slightly Disagree 5	Disagree 6	Strongly Disagree 7
3. I think other courses should be taught the same way Cisco classes are taught (online materials, online tests, and hands-on labs)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3.1 Please explain your response for question 3.

4. Consider your Cisco class in relation to your most recent Science class and then check the box that best describes how often you have done each of the following:

	For your Cisco class				For your Science class			
	Very Often	Often	Sometimes	Never	Very Often	Often	Sometimes	Never
a. Asked questions in class or contributed to class discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Made a class presentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Prepared two or more drafts of a paper or assignment before turning it in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Came to class without completing readings or assignments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Worked with other students in groups <b>during class</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Worked with other students in groups <b>outside of class</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Talked about future education plans with a teacher or an assistant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Talked about career plans with a teacher or an assistant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Discussed ideas from your readings or classes with others <b>outside of class</b> (students, family members, coworkers, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Worked harder than you thought you could to meet teachers' standards or expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Received mentoring or personal support from your teacher or an assistant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Consider your Cisco class in relation to your most recent Science class. During this semester, how much have your Cisco and Science courses emphasized the following activities?

	For your Cisco class				For your Science class			
	Very Much	Quite a bit	Some	Very little	Very Much	Quite a bit	Some	Very little
a. <b>Memorizing</b> facts, ideas, or methods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. <b>Understanding</b> information and its meaning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. <b>Applying</b> what you are learning to practical problems or new situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. <b>Creating</b> new, more complex interpretations and relationships by combining ideas and information in new ways	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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# CCNA3 Survey – Part 3



Survey  
**CCNA3 Student Experiences Survey**

**Part 3 of 3**

Directions: Answer the following questions by checking the response that best matches your level of agreement with each statement.

1. Consider your Cisco class in relation to your most recent Science class and then check the box that best describes to what extent your experience contributed to the following.

	For your Cisco class				For your Science class			
	Very Much	Quite a bit	Some	Very little	Very Much	Quite a bit	Some	Very little
a. Acquiring career or work-related knowledge and skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Writing effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Speaking effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Thinking critically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Working effectively with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Solving real-world problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Developing clearer career goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Developing a personal code of values and ethics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Contributing to the welfare of your community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Preparing for future education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Learning effectively on your own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. How long is your Cisco course?

4 weeks or less

3. Approximately, how many students are there in your Cisco class?

4. Did you begin your CCNA1 course at your current institution or elsewhere?

Started here

Started elsewhere

5. Which of the following best describes your current employment status?

Not working for pay

Working in a job **related** to your education

Working in a job **unrelated** to your education

5a. How many hours per week on average do you work for pay?

Select  hours per week

**Earn \$10 for Taking Future Survey**

Many students will be invited to participate in another short survey after they leave the Cisco program. Students who complete that survey will receive \$10 from Indiana University. If you are interested in taking that survey administered by Indiana University researchers, please select "YES" below.

Do you want to earn \$10 from Indiana University by taking a future survey?

YES

NO

Send Survey

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