

# **Students' Performance and Satisfaction with the Cisco Academy Networking Program for Pedagogical Action in Blended Learning**

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*Abstract* - Staying competitive in the IT field is a challenge. The use of IT certification programs involves a number of critical issues and implications for higher educational institutions (HEIs), educators, administrators, students, and the IT industry. Hence, there is a compelling need to gather and share IT certification program data to chart a comparative analysis across HEIs that are using certification programs. This study presents a summary of key findings among the Bachelor of Science in Computer Science (BSCS) students in the Lyceum of the Philippines University Batangas' performance and satisfaction level in Computer Networking 1, the first course in the four-course certification program. It used the descriptive method of research. Respondents of the study were the 71 BSCS second year students who took the course during the Second Semester of SY 2009-2010. Frequency distribution, Pearson R and weighted mean were used for data analysis. The performance and satisfactory level the students gave

to learning performance in Computer Networking 1 addresses their learning experiences and was an evidence of the pedagogical richness of the program and the contribution of the Computer Networking 1 teacher. In conclusion, the course actively engaged the students and a clear understanding of the subject were achieved.

*Keywords* - computer networking, satisfaction, performance

## INTRODUCTION

Staying competitive in the ever-dynamic information technology field is a challenge. Universities need to make sure that they are open and responsive to changes in the outside environment. There is a need to gather and share IT certification program data on the use of these programs to determine their effectiveness.

IT educators and administrators may be implementing curriculum programming decisions that are based on a variety of information, some of which may be based more on marketing and convenience than specific program information. Making informed curriculum decisions about commencing, maintaining, or terminating IT certification programs to ensure the employability of students and their prolonged success in the IT workforce must be made (Randall, 2005).

Lyceum of the Philippines University (LPU) Batangas specifically the College of Computer Studies (CCS) in its vision to be a premier university in the Asia Pacific Region desires to provide globally competitive education to its BSCS and BSIT students. It is important for LPU to ensure that its CCS graduates have the technical skills expected of them by society, hence, its use of the Cisco Certified Network Associate (CCNA) certification program.

This study presents a summary of key findings in the Lyceum of the Philippines University Batangas Bachelor of Science in Computer Science (BSCS) students' performance and satisfaction in Computer Networking 1, the first semester in the four-semester.

The four-semester CCNA Program is equivalent to a 280-hour

curriculum that prepares and trains students for industry-standard certifications. It delivers Web-based educational content, online testing, student-performance tracking, hands on labs and instructor training and support (Simmonds, 2004).

The program exerts strong control over the content but leaves the pedagogy of teaching to instructors. This blended learning system does not replace the teacher-student relationship. Blended learning mixes various event-based activities including face-to-face instruction, live e-learning and self-paced learning. ([www.css.uni-graz.at/courses/TeLearn/SS05/Presentation/Blended\\_Learning.ppt](http://www.css.uni-graz.at/courses/TeLearn/SS05/Presentation/Blended_Learning.ppt)).

In LPU Batangas, administrators and instructors believe on the benefits of personal instruction provided by teachers in traditional classroom settings and merge this with online access to interactive, media rich technologies along with assessment tools.

The need to measure performance and satisfaction is critical in order to evaluate whether the blended learning system that is currently being employed locally in LPU actually meet the students' needs. This study identified how the first semester was experienced by the primary stakeholders, the students in this new learning environment called blended learning. It examined processes through the perception of students with the improvement of these processes for further development in mind. Further, the study may inform future research in this area. It examined processes through the perception of students with the improvement of these processes for further development in mind. Further, the study may inform future research in this area.

## **MATERIALS AND METHODS**

To find out if instruction quality, course materials, software and hardware availability have significant impact on student satisfaction and success, the researcher adopted the online course evaluation survey via five-point Likert scale items developed by Cisco. The hands-on skills exam was also used as an indicator of classroom performance as the laboratory activities enable students to apply key concepts in a practical setting. The quality of lab exercises was measured on the course evaluation survey via a set of five-point Likert scale items.

The study used descriptive research. It involved the collection of

data in the attempt to test the hypothesis that there is no significant difference between the performance and satisfaction level in Computer Networking 1 and also with the different questions posted as regards to the status of the subject under study.

Respondents of the study were all the 71 B.S. in Computer Science second year students in the College of Computer Studies, Lyceum of the Philippines University Batangas who took the Computer Networking 1 subject during the Second Semester of SY 2009-2010.

The data generated from the study were analyzed using frequency distribution, weighted mean and Pearson R. Frequency distribution was used to determine the final grade of students in Computer Networking 1. Weighted mean was used to measure the satisfaction level and performance of students in Computer Networking 1. Pearson R was used to examine the relationship between the performance of students and their satisfaction level in Computer Networking 1. Likert scale was used to interpret and analyze the results.

## RESULTS AND DISCUSSION

Students' performance was discussed in terms of students' ability to do the simulation of realistic work scenarios, ability to display networking skills and their final grade in Computer Networking 1. On the other hand, their satisfaction level was measured in terms of classroom instruction, access to equipment/software learning performance and personalized feedback/assessment.

Students' performance in networking skills in terms of ability to simulate realistic work scenarios obtained a composite mean of 3.77 which is verbally interpreted as "Agree". This agreement includes students' know how to use the skills learned in the course to implement solutions to common problems ( $x=3.83$ ) got the highest rank, followed by capability to evaluate whether the solutions implemented worked ( $x=3.79$ ), and be able to identify and come up with solutions to common problems ( $x=3.70$ ).

Table 1. Students' performance in networking skills in terms of ability to simulate realistic work scenarios

In a real-life situation I could use the skills I have learned in this course to:	Weighted Mean	Verbal Interpretation	Rank
1. Identify and come up with solutions to common problems	3.70	Agree	3
2. Implement solutions to common problems	3.83	Agree	1
3. Evaluate whether the solutions implemented worked.	3.79	Agree	2
<b>Composite Mean</b>	<b>3.77</b>	<b>Agree</b>	

In as far as developing students' ability in simulating realistic work scenarios, teachers were tasked to teach the concepts of cabling, subnetting, assigning of IP addresses to all the interfaces and performing all the basic router configuration commands using the software, Router e-sim and Packet Tracer.

With these results, students claimed that they are applying the technical theories learned to simulate skills in solving problems in life. Additionally, the agreement rating to these skills can be attributed to the teaching strategies employed by their Computer Networking 1 teacher. This is an implication of the social learning theory of Bandura that learning has a considerable impact on the strategies teachers use in classrooms for it provides tools for planning instruction, teaching skills and knowledge and thereby students' learning become very applicable to their day to day life activities (Groves,2008).

It was found out that students are very confident in their ability to display networking skills with a composite mean of 3.63. They admitted their ability to describe the operation of basic LAN devices such as hubs, bridges and switches, ( $x=3.77$ ), describe the operation of an Ethernet network, ( $x=3.76$ ), describe the functions provided by each of the seven layers of the OSI model, ( $x=3.68$ ), determine the boundaries of collision and

Table 2. Students' performance in networking skills in terms of ability to display networking skills

Items	Weighted Mean	Verbal Interpretation	Rank
1. Cable and configure a local area network (LAN)	3.61	Very Confident	5
2. Describe the functions provided by each of the seven layers of the OSI model	3.68	Very Confident	3
3. Calculate subnet addresses when given an IP address of any class and the number of usable networks needed	3.45	Confident	7
4. Describe network communication using the TCP / IP protocols	3.54	Very Confident	6
5. Determine the boundaries of collision and broadcast domains	3.62	Very Confident	4
6. Describe the operation of an Ethernet network	3.76	Very Confident	2
7. Describe the operation of basic LAN devices such as hubs, bridges and switches	3.77	Very Confident	1
<b>Composite Mean</b>	<b>3.63</b>	<b>Very Good</b>	

broadcast domains, ( $x=3.62$ ), cable and configure a LAN, ( $x=3.61$ ), describe network communication using the TCP/IP protocols, ( $x=3.54$ ), and calculate subnet addresses when given an IP address of any class and the number of usable networks needed, with the least weighted agreement value of 3.45.

Students developed such performance level because of the innovative education machinery of the Cisco CCNA Program. This delivers the very basic knowledge in Computer Networking 1, their first online course embedded with interactive tools and simulation lab activities.

Additionally, it helps students develop their skills, which are believed to be what are truly needed to fill Information and Communication Technology positions in the computer networking industry. The least level of performance was noted on calculating subnet addresses when

given an IP address of any class and the number of usable networks needed. ( $x= 3.45$ ) which is by nature a mathematical-focused activity. As students claimed, the process entails computation of subnets in order to determine the specific addresses to be assigned to the interfaces to allow computing devices to communicate. Such demands analysis and logical thinking. Nearly all researchers agree teaching critical thinking skills are a desirable aim of education (Hemming, 2000).

Table 3. Students' performance in computer networking  
1 in terms of final grade

Student's Performance Descriptive Point rating Average	Frequency	Percentage (%)	Rank
Excellent 1.0 -1.50	5	7.00	5.5
Above Average 1.75	5	7.00	5.5
Average 2.00	30	42.30	1
Average 2.25	13	18.30	2
Fair 2.50	3	4.20	7
Fair 2.75	7	9.90	4
Poor 3.00	8	11.30	3
<b>Total</b>	<b>71</b>	<b>100.00</b>	

Most of the students have an Average performance of 84-89% (2.0-2.25) rating comprising 60.66 percent. It is followed by 11.30 percent with a descriptive rating of Poor or a point average of 3.0 or 75 percent. Out of 71 responses, there is only 14 percent of Above Average or Excellent rating with a grade of 97% and above.

The result is an implication of the students' first exposure to the modern method of presenting lessons. There are some of them who belong to the Fair rating and Poor performance

The CCNA Program provides a rigorous course that aligns with international educational standards to keep pace with the changing requirements of an increasingly connected world and the growing demand for technical skills in a competitive global marketplace.

The study revealed that students are satisfied in all the items with a composite mean of 4.08. The satisfaction level includes access to equipment/software ( $x=4.13$ ), learning performance in labs ( $x= 4.08$ ), curriculum materials ( $x=4.07$ ), and class room instruction ( $x=4.7$ ).

The satisfaction level of students can be best explained by their access to the CCNA Program of the Cisco Systems. Since LPU Batangas is considered a CCNA Local Academy it has provided the software installed in all the

Table 4. Students' level of satisfaction in computer networking 1

Dimensions	Weighted Mean	Verbal Interpretation	Rank
1. Classroom Instruction	4.07	Satisfied	3.5
2. Access to Equipment / Software	4.13	Satisfied	1
3. Learning Performance			
3.1 Curriculum materials	4.07	Satisfied	3.5
3.2 Laboratory	4.08	Satisfied	2
4. Personalized Feedback/Assessment	4.06	Satisfied	5
<b>Composite Mean</b>	<b>4.08</b>	<b>Satisfied</b>	

computers in its Cisco Laboratory. Teachers' lecture and classroom instruction activities are embedded in the software which also includes the simulation and interactive laboratory activities contributory to the level of students' understanding of learning materials. According to the students, the teachers were able to present the topics and they receive an online evaluation of their performance.

This helps the teachers immediately identify students' weaknesses, give the necessary remediation and find alternative techniques in order to supplement classroom instruction.

The online assessment of students and feedback on their performances were least rated with satisfaction ( $x=4.08$ ). As observed



by the Computer Networking 1 teachers, their students first exposure to this type of instructional strategy influences their behavior and in knowing their performance.

Table 5. Relationship between the students' performance and the level of satisfaction in terms of classroom instruction

Items	r value	P value	Interpretation
Ability to do simulation of realistic work and scenarios	0.479	0.000	Highly Significant
Ability to display Networking skills	0.563	0.000	Highly Significant
Final grade in Networking 1	0.135	0.261	Not Significant

As indicated from the table, the computed r values of ability to do simulation of realistic work and scenarios and to display networking skills indicate highly positive correlation with p values less than 0.01 level of significance, thus the null hypothesis of no significant relationship between the students' performance (ability to do simulation of realistic work and scenarios and to display networking skills) and level of satisfaction in terms of classroom instruction is rejected.

This means that there is a significant relationship that exists between the two variables, therefore as the students performed better on the two networking skills, their level of satisfaction in classroom instruction increases. Final grades do not have significant relationship although it shows a minimal correlation.

The results of the very confident level rate of students on networking skills is an affirmation of what have been posited in a lot of previous researches conducted, that the quality of teachers is the most important variable in increasing student's achievement. It has a great effect on students' learning and performance in class.

In this sense, it has to be recognized that the student's grade is not in all cases a reliable indicator of developed skills, thus the final grade of students in Computer Networking 1 is not contributory to their level of satisfaction.

Table 6. Relationship between the students' performance and the level of satisfaction in terms of access to equipment / software

Items	r value	p value	Interpretation
Ability to do simulation of realistic work and scenarios	0.135	0.261	Not Significant
Ability to display Networking skills	0.085	0.483	Not Significant
Final grade in Networking 1	0.246	0.039	Significant

It can be noted from the results that only final grade shows significant relationship on access to equipment or software since the obtained p value is less than 0.05 level of significance. Therefore, the null hypothesis is accepted that students' performance is not related to students' level of performance in the ability to do simulation of realistic work scenarios and ability to display networking skills. However, students' satisfaction with regards to access to equipment/software was affected by their final grade in Computer Networking 1. Therefore students' final rating in Computer Networking 1 influences their level of satisfaction in terms of access to equipment/software.

As seen from the results the ability to do simulation of realistic work and scenarios and to display networking skills are highly significant to the students' satisfaction on learning performance because the computed r value indicate moderate positive correlation and p values are less than 0.01 level of significance. This means that students' level of satisfaction in terms of learning performance depends on the students' ability to do simulation of realistic work and scenarios and displaying networking skills.

It is considered that the measurement of student's satisfaction is a result of the learning experiences in order to remain motivated. As Kelly (2002) further expressed an instructor has to provide students with opportunities to perform hands-on exercises relative to software and equipment.

Table 7. Relationship between the students' performance and the level of satisfaction in terms of learning performance

Items	r value	p value	Interpretation
Ability to do simulation of realistic work and scenarios	0.333	0.005	Highly Significant
Ability to display Networking skills	0.358	0.002	Highly Significant
Final grade in Networking 1	0.080	0.508	Not Significant

Therefore, the students' average performance in Computer Networking 1 is influenced by how the teachers present the lessons and how they developed the skills necessary to learn the course included in the Cisco Networking Academy Program

Table 8. Relationship between the students' performance and the level of satisfaction in terms of personalized feedback / assessment

Items	R value	p value	Interpretation
Ability to do simulation of realistic work and scenarios	0.010	0.931	Not Significant
Ability to display Networking skills	0.127	0.291	Not Significant
Final grade in Networking 1	0.041	0.735	Not Significant

All computed r values shows minimal positive correlation and p values are greater than 0.01 level of significance, thus the null hypothesis of no significant relationship between the students' performance and satisfaction is accepted. This means that there is no significant relationship that exists between the students' performance in terms of the ability to do simulation of realistic work and scenarios, to display networking skills and final grade in Computer Networking 1 and the respondents' level of satisfaction in terms of personalized assessment and feedback. It can be inferred that the students' personalized feedback was not affected by their level of confidence in the subject Computer Networking 1 and the skills they acquired in the application and simulation activities. Feedback may only be contributory to their

identification of their performance in order to review their weaknesses.

### *Implications*

Ultimately, the most important indicator of instructor quality is the achievement of students, as reflected in the student results data. The students are satisfied with classroom instruction with a weighted mean of 4.08. This emphasizes the fact that the instructor is central to the instruction and learning of the student, demonstrating that instructors' teaching skills and professionalism are directly related to the students' enjoyment of the unit. The instructor ensures the effective integration of the two main components of blended learning, face-to-face instruction and Internet technology.

Access to equipment/software was ranked first as to students' level of satisfaction with a weighted mean of 4.13. This goes to show that students learning labs combined with self-paced learning and instructor support assists the learner to the successful completion of the modules.

Students were satisfied with the curriculum materials and the labs which have weighted means of 4.07 and 4.08. Learning that facilitates the transfer of tacit knowledge requires a competency-driven approach. Because students absorb tacit knowledge by observing and interacting with peers and the instructor, activities that include a blend of performance support tools with live mentoring helped the students perform well in the Computer Networking 1 course.

Personalized feedback/assessment has a weighted mean of 4.06, the least satisfied rating. Online feedback where students immediately see the result of their module exams and the topics that they missed are contributory to their performance in order to review their weaknesses. The least satisfied rating can be interpreted as to the students' attitude to a first time exposure to blended learning.

The students' personalized feedback was not affected by their level of confidence in the subject Computer Networking 1 and the skills they acquired in the application and simulation activities.

## CONCLUSIONS

In light of the findings of the study, the following conclusions were drawn:

1. Students' ability to do simulation of realistic work scenarios and display skills learned in Computer Networking 1 can be applied to their day-to-day life activities such as those that they may encounter in a home or small office. Their average rating in the subject shows that they are developing confidence in the Cisco Networking Academy Program which can be very useful in as far as Information and Communications Technology skills acquisition is concerned.
2. The students' performance and satisfaction level are evidences of the pedagogical richness of the Cisco Networking Academy Program and the contribution of the Computer Networking 1 teacher. The students' performance in the classroom is largely affected by the quality of teachers assigned to teach Computer Networking1 and their accessibility to equipment and software. The satisfaction level of students in Computer Networking 1 is an indication of the exciting and dynamic nature of tools used that positively challenged and engaged the students. The satisfactory level the students gave to learning performance in Computer Networking 1 addresses their learning experiences. It is concluded that the course actively engaged the students and a clear understanding of Computer Networking 1 concepts was achieved. Online feedback where students immediately see the result of their module exams and the topics that they missed are contributory to their performance where students were able to assess their answers and correct any misconceptions before proceeding to the next topic.

## **RECOMMENDATIONS**

Based on the relevant findings and conclusions reached in this study, the following recommendations are proposed:

1. The Lyceum of the Philippines University Batangas and the College of Computer Studies must continuously avail of the Cisco Networking Academy Program. Results from this study has proven that the Cisco Networking Program has helped BSCS and BSIT students enrolled in Computer Networking 1 to develop their logical thinking and analysis of real-life problems.
2. Understanding networks and how networks operate requires an understanding of concepts and processes that are both complex and abstruse. The use therefore of tools to demonstrate, simulate or visualize will lend itself very readily to teaching. Hence it is important that teachers assigned in Computer Networking 1 focus on the importance of the tools and how it is used. Practical exercises to be used must be based on material introduced in an earlier lecture given by the Computer Networking 1 teacher.
3. The administration must keep on sending Computer Networking instructors to national conventions and retooling seminars for them to keep track of global updates on the curriculum. In essence, the crux of the school's mission to produce globally competitive students lies within its adaptability to the changing technology. Transformations caused by advances in Information and Communications Technology must be implemented as soon as they become available.
4. Blended learning is a powerful training solution that combines e-learning with a variety of other delivery methods for a superior learning experience. This study reveals what makes blended learning so powerful, and how to choose the right mix of delivery methods for the best blend of skill enhancement and sustainability to ensure Lyceum of the Philippines University Batangas' long-term competitive advantage.
5. It is also recommended that the course be offered to non-CCNA students or professionals who want to have computer networking knowledge via a short-term course program.
6. A replication of this research may be conducted to determine the usability of a blended learning program such as a study on how

effective the learning program has been as well as evaluating the performance of each learner from semester 1-4. Studies on other aspects such as the comparison of the effectiveness between the traditional teaching approach and blended learning may be explored to give better insights that may be valuable inputs to decision making concerning global competitiveness in the field of Information and Communications Technology.

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