Curriculum Analysis Project

Haisong Ye

Curriculum Documentation and Origins

I. How is the curriculum documented?

1. On what curriculum and standards documents and other resources will you base your analysis? What state and national standards are relevant to the curriculum?

I will use the CCNA Discovery curriculum[1] for this analysis. Available documents include a set of online courses, booklets for each courses, evaluation samples, and papers about the curriculum. The curriculum aligns with the standards of CCENT certification[2], which is an entry-level certification in computer networking provided by Cisco System, Inc.

2. On what aspects of the analysis do the documents focus?

The curriculum documents provide clear learning objectives, content, and sequence through its online courses and booklets. It also has detailed evaluation information, including what knowledge and how it will be assessed. Kridel (2013) explains why the curriculum was important for career developing. Thompson (2004) did a survey on evaluating high school IT curriculum, which was using the similar course that developed by Cisco Network Academy.

3. What limitations in documentation do you find?

I did not find information about guidance of how to teach the objectives and content. It is also unclear that what kinds of personnel behind the curriculum. Moreover, there is no history data available for analysis.

[1] http://www.cisco.com/web/learning/netacad/course_catalog/CCNAdiscovery.html

[2] http://www.cisco.com/web/learning/certifications/entry/ccent/index.html

II. What situation resulted in the development of the curriculum?

1. If you can find out, who made up the cast of characters in the development of the curriculum? What were their names, with what institution were they affiliated, and what were their respective roles in the project? Within the project team, who represented the learners, the teachers, the subject matter, and the milieu? Was there an obvious blind spot on the team?

I cannot find out who made up the development team. The author is Cisco Networking Academy, which "is an innovative Cisco education initiative that delivers information and communication technology (ICT) skills to improve career and economic opportunities around the world. The Academy provides online courses, interactive tools, and lab activities to prepare individuals for information/communications technology and networking careers in virtually every industry" (Cisco Systems Inc., 2013b, para. 1).

2. To what social, economic, political, or educational problem was the curriculum attempting to respond?

This curriculum is a vocational training curriculum. However, it still can be used in secondary schools and universities as a curriculum of information and communication technology (Cisco Systems Inc., 2013a). The main social problem it was attempting to respond is the workforce in computer networking area. It is a basic curriculum for a qualified networking professional. It also has economic purpose here. By providing good training programs, more people can use Cisco products. Therefore, Cisco System, Inc. can promote their productions and technology to the industry standard level, and then stimulate sales performance.

3. What planning elements dominated the curriculum development process?

In this curriculum, learning objectives, activities, hands-on labs, and evaluation dominated the curriculum development process. All modules are begin with a list of learning

objectives, a set of questions that learners should be able to answer and key terms that learners should be able to define when they finished their learning. Activities are presented in each module with a variety of forms, such as matching pairs, calculations, observations, and interactive animations. Activities focus on the knowledge and understanding levels of learning. Typically, there are 3-5 activities for each module. Hands-on labs focus on doing. Learners can do hands-on labs in real network environments or in a simulate environments. A network simulator, Packet Tracer[3] (PT), is provided by the curriculum. In PT, learners can use pre-created network diagram or create a new network diagram. Data communications can be simulated in PT and observations are available. For example, learners can send a packet from one computer to another computer and capture the protocol data unit at different layers on different devices to check the protocol used by the device and data in the data unit. Hands-on Labs are designed for learning outcomes at application, analysis, and evaluation levels. At the end of each module is a section called "Check Your Understanding", which is a self-check assessment with answers and explanations provided.

III. What perspective, if any, does the curriculum represent?

This curriculum represents behavioral perspective and constructivist perspective. From the behavioral perspective, all learning objectives in this curriculum are stated in an observable behavior statement, for example, "Identify and describe the various networking threats" and "Construct and terminate twisted pair cables and determine type of cable needed". The learning goal of the curriculum is that learners can design, implement, and maintenance computer

[3] http://www.cisco.com/web/learning/netacad/course_catalog/PacketTracer.html

network with Cisco products and technology. In other words, it emphasizes on what learners could do (behavior) when they finished this curriculum.

From the constructivist perspective, the learning objectives, activities, hands-on labs, and sample assessment questions indicate that rote learning is not working in this curriculum. Learners must construct their own understanding of knowledge and apply in problem solving tasks. For example, knowing the concept and structure of IPv4 address is not enough. Learners need to design and allocate IPv4 address to devices in a particular network. The solution of the task might be unique and will not work in other types of network.

The Curriculum Proper

IV. What are the purposes and content of the curriculum?

1. What aspects of the curriculum are intended for training, and what aspects are intended for educational contexts?

The CCNA Discovery curriculum is designed for training, particularly for the interconnecting Cisco networking devices. Learners who finished this curriculum are supposed to be a computer network professional who can analyze, design, implement, optimize, and maintenance computer networks with Cisco products and technology. To educational context, there are several soft skills to communicate with people effectively. Although these skills are used for collect information for design and maintenance computer network, I think that these skills are also useful in daily life.

2. At what level, if at all, does the curriculum express its purposes?

The curriculum expresses its purposes at learning objectives, educational goals, and educational aim.

Educational aim:

"The Cisco CCNA Discovery curriculum provides general networking theory, practical experience, and opportunities for career exploration and soft-skills development" (Cisco Systems Inc., 2013a, para. 1).

Educational goal:

"The curriculum teaches networking based on application, covering networking concepts within the context of network environments students may encounter in their daily lives – from small office and home office (SOHO) networking to more complex enterprise and theoretical networking models later in the curriculum" (Cisco Systems Inc., 2013a, para. 1).

Learning objectives (Samples) (select from Cisco Systems Inc., 2013c):

- Describe the purpose and functions of various network devices
- Select the components required to meet a given network specification
- Describe common networking applications including web applications
- Describe the purpose and basic operation of the protocols in the OSI and TCP models
- Implement and verify basic security for a switch (port security, deactivate ports)
- Identify, prescribe, and resolve common switched network media issues, configuration issues, auto-negotiation, and switch hardware failures
- Implement static and dynamic addressing services for hosts in a LAN environment
- Identify and correct IP addressing issues

3. What educational goals and educational aims are emphasized, and what are their relative priorities?

The curriculum emphasized on general networking theory, practical experience, and opportunities for career development. The priority is to get the certifications and have a good job in the IT field.

4. What types of learning objectives are included and emphasized in the curriculum?

According to Bloom's taxonomy in cognitive domain, the curriculum has following types of learning objectives.

Type	Example in the curriculum	Key words
Knowledge	• Describe the purpose and functions of various network devices	Describe
Comprehension	• Use the OSI and TCP/IP models and their associated protocols to explain how data flows in a network • Interpret network diagrams	Explain, Interpret
Application	• Implement and verify basic security for a switch (port security, deactivate ports) • Create and apply an addressing scheme to a network	Implement, Create, Apply
Analysis	• Identify and correct common network problems at layers 1, 2, 3 and 7 using a layered model approach • Identify and correct IP addressing issues	Identify and correct,
Synthesis	• Differentiate between LAN/WAN operation and features	Differentiate
Evaluation	• Perform and verify routing configuration tasks for a static or default route given specific routing requirements	Verify

5. What are the primary ways in which the curriculum represents the subject matter to students?

This curriculum provides a computer-based learning environment. Teachers can use the online courses in classroom for class presentation, discussion, and practice. Students also can use it by themselves. The subject matter is presented by multimedia methods, including text, sound, animation, and video. The curriculum ask students to do six things, taking notes, thinking about it, practice, practice again, teach it, and make changes as you go. Practice is emphasized twice. There are many hands-on labs for students in either simulation environment or real labs.

6. Does the curriculum have a view of multicultural education in its content? Would you consider it assimilationist, multiethnic, or social reconstructionist view?

The curriculum is open for many countries and areas around the world and has different versions in English, French, International Spanish, Russian, and Simplified Chinese. Although it deals with people from different culture backgrounds, I do not think it has a view of multicultural education, because it does not treat people in multi-ways except the language (the content is still the same).

7. How is it determined if students have met the standards? What are the consequences for students, teachers, and schools, if it is determined that students have not met the standards? Does it matter if you adhere to the standards?

There is a certification exam for the curriculum, 100-101 ICND1 exam[4]. It's standard exam provided by Cisco Network Academy. If the students have not met the standards, they

[4] http://www.cisco.com/web/learning/exams/list/icnd1b.html

won't get the certificate. If the certificate is the target of my course, it does matter to align with the standards. Otherwise, it does not matter.

8. Is the curriculum aligned with the standards? Does the curriculum facilitate student understanding of the content and processes espoused by the standards? Are portrayals of the nature/structure of the discipline congruent between the curriculum and the standards? Are the balances of depth and breadth of the curriculum and the standards congruent? Are the standards cited for each topic/activity?

The curriculum is aligned with standards strictly. The curriculum uses presentation, activities, hands-on labs, self-check quizzes, and online discussions to help student learn. The depth and breadth of the standards are covered but also limited by the curriculum. The standards are cited at the beginning of each chapter on the booklets but not on the online courses. Each hands-on lab has cited standards.

9. How does technology affect the content of the curriculum?

Multimedia technology changed the form of the content. A lot of the content in this curriculum are presented in interactive Flash animations and videos. Simulation technology also change the way of doing hands-on labs. Students now can use a simulation software to create, configure, and observe a network rather in a real expensive computer-networking lab.

V. What assumptions underlie the curriculum's approach to purpose or content?

1. What conceptions of learning, objectives, curriculum, and teaching underlie the materials you are analyzing?

In this curriculum, the conception of learning is based on the constructivist perspective. Learning is a process of construct a learner's own knowledge based on what the learner's prior knowledge or experiences. Learners are encouraged to apply what they learned into authentic

problem solving tasks, such as in hands-on labs. Objectives are stated in observable behaviors. Because it is a training curriculum, the objectives are what learners can perform after they finished the curriculum. Curriculum is a whole package of standards, syllabus, outline of content, learning guides, learning materials, lab materials, sample of assessment, and a series of courses. Teaching is in a guidance role more than a dominant role.

2. What aspects of a hidden curriculum are likely to accompany the conceptions and perspectives underlying the curriculum?

The aspect of a hidden curriculum is to teach learners how to learn. Knowledge in IT is dynamic. It is impossible to teach all skills, but it can foster learners' learning habit. For example, it suggests that you can learn more by teaching others, because if you want to teach others, you must know more.

3. To what extent is the curriculum likely to play a hegemonic role in its purposes or content?

In this curriculum, only Cisco devices and technologies are covered, because this curriculum is supposed for preparing the CCNA certification. However, it also could be used in schools as a general technology curriculum (Cisco Systems Inc., 2013a). Excluding other companies' devices and technologies could be a kind of hegemonic.

VI. How is the curriculum organized?

1. What provision, if any, is made for macro-level vertical and/or horizontal organization?

The vertical organization is obvious. The curriculum consists of four courses: *Networking for Home and Small Business*, *Working at a Small-to-Medium Business or ISP*, *Introducing*

Routing and Switching in the Enterprise, and *Designing and Supporting Computer Networks*. The four courses are taken sequentially (Figure 1).

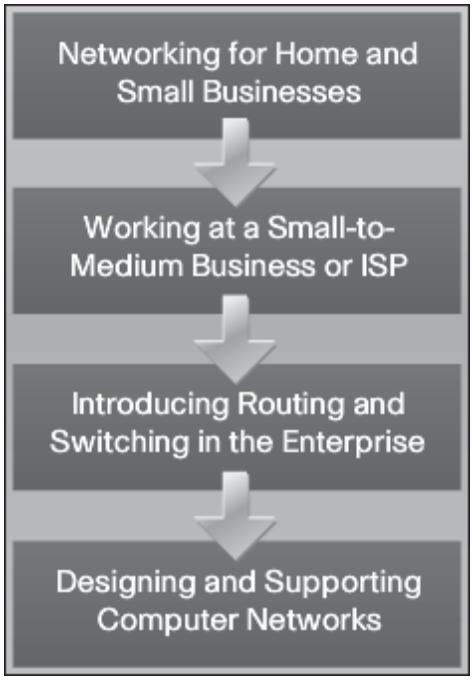

Figure 1. The sequence of courses (Adapted from http://www.cisco.com/E-Learning/prod/curriculum/cco_tdo_ldd/demos/CCNAcurricGuideDisEx/files/white.html)

There is no noticeable evidence of horizontal organization at macro level.

2. What basic configurations of content are found at a more micro level?

At micro level, each course has a vertical configuration. For example, the first course – *Network for Home and Small Businesses* consists of 10 chapters. Chapters are designed to be learned in sequence. Learners must have a basic idea of computer network, and then to learn how to connect to the Internet, and then learn IP addressing and how to manage IP addresses.

3. How are the various media employed to deliver the curriculum?

The curriculum is mainly delivered through an online learning environment. The courses have integrated text, graphics, and videos. Many interactive activities are provided to reinforce

students' comprehension. All learning progress and self-check quizzes are recorded in the system to help teachers and learners be aware the learning statues. Text based booklets, which is corresponding to the online courses, are available. It also has the software, Packet Tracer, for simulating a network lab. Students can implement a variety type of networks, from simple P2P network to an enterprise scale network.

4. What organizational principles does the curriculum employ? Does or can technology play a role in the curriculum organization?

Based on the subject matter, the curriculum employs the world-related principle. It teaches concepts on their relationships with the real world. For example, it teaches IP addressing as an identification of device in a network. The learners are supposed to be motivated to learn the curriculum. This curriculum is designed for training purpose, to prepare the learners for entry-level IT careers and help them prepare for Cisco certifications. Learners who chose to enroll this curriculum should be interested in or have needs to be enrolled. Teachers' main task in the curriculum is to monitor, guide, and provide on-demand help. Technology does play a role in the curriculum organization, especially from the computer simulation and online learning community.

6. Does the curriculum organization increase or decrease the likelihood that tracking will be used?

It could be. The four courses are progressively in complexity. Lower ability students might only choose the first two courses.

VII. What assumptions underlie the curriculum's organization?

1. What epistemological assumptions, if any, underlie the curriculum's organization?

The curriculum is organized in a project approach. The epistemological assumption is that concepts in mind and experience in the world have interactive relationship. Learners first develop some new ideas in computer network, then attempt these ideas in activities and hands-on labs, then reflect the effects of these activities through self-reflection questions and discussion.

2. What psychological assumptions, if any, underlie the curriculum's organization?

The psychological assumption is that people learn by doing. Only concepts and principles are not enough to meaningful learning. Students must apply the knowledge they learned into authentic problems. For example, knowing the concepts of IP address and the principles of address assignment cannot ensure the leaner can perform a real task. Only when the learner can apply the concepts and principles into real world problems is meaningful learning.

3. What other assumptions, if any, related to your curriculum's organization underlie the curriculum?

The content and organization should be consistent with learners' interests and needs. Students choose this curriculum because they want to be an IT or IT related professional, so the curriculum should be based on relevant materials and the opportunities to apply their new learning into authentic activities.

The Curriculum in Use

VIII. How should the curriculum be implemented?

1. What are the temporal, physical, organizational, and political-legal requirements of the curriculum?

This curriculum has four courses. Each course needs approximately 30-40 hours to be completed. The schedule of time is not specified. Instructors with experiences in former cisco curriculum need a minimum of 4 to 8 hours for each course, and new instructors need approximately 60-80 hours of training per course (Cisco Networking Academy Program, 2007).

The curriculum recommends a special network lab with computers and Cisco devices, at least one switch, four routers, one wireless access point, several wireless adapters, two computers, and cables and networking hardware tools. However, through the simulation software, Packet Tracer, most hands-on lab can be performed.

If the curriculum is provided as a training program to pursue Cisco certifications, the organization must have been certified by Cisco Networking Academy, and the instructors must be certificated Cisco Networking Academy instructors. If the curriculum is implemented as a general technology course, it doesn't have to meet these requirements.

2. 2. What are the probable costs and benefits associated with the curriculum change?

School need to create a lab for the curriculum, including required equipment. Teachers also need to be trained to get Cisco instructor's certification.

The benefit is student can learn skills that could be helpful for finding an IT related job. If students could be more successful in job market, more students would enroll the program.

4. What values are embedded in the curriculum, and how well are these values likely to be suited to the community?

The curriculum is helpful to improve students' working skills. It can train more qualified-workforces in the area of information technology. It could increase the employment opportunities.

5. To what extent is the curriculum aligned to the standards?

The curriculum is mainly for the Cisco CCNA certification, so it is highly aligned to the standards of that certification. From the discipline of computer science, it might be not in enough depth and breadth. However, as an entry-level curriculum, it focuses more on the application than theory.

7. To what extent does the curriculum take into account the students' cultural, ethnic, or social backgrounds? To what extent does it accommodate gender differences?

I did not find any explicit information about cultural, ethnic, social backgrounds, or gender differences.

IX. What can you learn about the curriculum from an evaluation point of view?

1. What, if any, data does the curriculum provide? What conclusions about the curriculum seem warranted based on the data provided?

The curriculum does not provide any specific data.

2. What standardized tests are relevant to this curriculum? How well is the curriculum aligned with the relevant standardized tests?

The Cisco CCNA Certification exam is relevant to the curriculum. The curriculum is the first part for the certification. Other two courses are CCNA Exploration and CCNA Security. This curriculum is covering essential knowledge and skills for the exam.

3. What instruments or suggestions for collecting data does the curriculum provide? Are these tools equally fair for all social, economic, cultural, and ethnic groups?

The curriculum does not provide suggestions for collecting data. Exam takers will take exam personally. All data about the exam are confidential.

4. What are your concerns about the curriculum that could be clarified by evaluation data? Consider short-term outcomes, long-term outcomes, antecedents, and transactions.

The summative evaluation is out of my control. However, we can perform formative evaluation before students take the certification exam. In this way, we can analyze the evaluation data and improve the curriculum implementation.

5. Does the approach to student evaluation in the curriculum manifest a measurement-based or an integrated approach, or both?

The curriculum uses a measurement-based evaluation. This is a short-term training curriculum for approaching a career certification. The certification exam is standardized and objective-driven.

6. What would a neo-conservative (or radical) evaluation of the curriculum look like?

The evaluation of the curriculum is highly depending on the summative evaluation, the certification exam. However, during the learning process, formative assessments are provided for

each individual learner. Learners can control their learning-pace and perform self-assessment before taking the certification exam.

Critique

X. What is your judgment about the curriculum?

1. What are its strengths and weaknesses?

This curriculum is delivered in an interactive online learning environment. Even self-study is effective if the learner has good self-regulation skills. The curriculum emphasizes the application of learned knowledge rather than rote learning. It provides many interactive activities and hands-on labs. The learning tracking mechanism, such as learning progress recording, self-check quizzes, and self-reflection activities, can provide detailed learning path or learning state to both instructors and students. It also provides a learning community to foster collaborative learning habits. Students are encouraged to use teaching other students as a way to improve their own learning.

The weakness is that the content is limited in Cisco devices and technology. If it were considered as a general technology course, the content would be too narrow.

2. Of what dangers would you want to be careful if you implemented it?

The only danger that I want to be careful is physical harm in labs.

3. How would you adapt it to maximize its benefits and strengths and to minimize its limitations and risks?

To maximize its benefits, I would use blended learning approach, which would integrate online learning and classroom learning. Online learning would focus on reading materials and interactive activities. Students also can preview hands-on labs in the simulated software to get

basic ideas and theoretical outcomes. In classroom learning, or lab learning, students would apply their new knowledge into real tasks. Although it could be the same content in simulated environment, it would be more complex in a real situation, for example, power failure of devices or misconfigurations made by previous learners.

I also would consider group-learning strategies. Students learn online individually, and study in groups in classroom. Students would be asked to share what they learned in online courses, what they do not understand, how to resolve problems in hands-on lab, etc. I would also encourage students to lead their group in turn, so they all have opportunities to gain some soft skills in team management and cooperation work.

To minimize its limitation, I would like to raise students' awareness of other types of device and technology. For example, I would encourage students to do research on network devices that produced by other companies and compare them with Cisco products. For lab safety, I would like to perform safety education, such as providing safety tips and lab operational rules.

References

Cisco Networking Academy Program. (2007). Frequently Asked Questions: New Cisco CCNA Curricula. Retrieved August 6, 2013, from http://www.cisco.com/web/learning/netacad/downloads/pdf/NewCCNAAcademyFAQs.pdf

Cisco Systems Inc. (2013a). CCNA Discovery. Retrieved August 5, 2013, from http://www.cisco.com/web/learning/netacad/course_catalog/CCNAdiscovery.html

Cisco Systems Inc. (2013b). Cisco Networking Academy. Retrieved August 5, 2013, from http://www.ciscopress.com/authors/bio.asp?a=ECCFCEF7-1AD5-48C8-86F1-4A49B47690DC

Cisco Systems Inc. (2013c). IT Certification and Career Paths: 100-101 ICND1. Retrieved August 5, 2013, from http://www.cisco.com/web/learning/exams/list/icnd1b.html

Kridel, T. (2013). WHY IT CERTIFICATIONS MATTER. *Sound & Video Contractor, 31*(3), 54-60.

Thompson, B. A. (2004). Evaluating High School IT. *Tech Directions, 64*(3), 28-29.