Teaching Computer Networking Fundamentals using the Apprenticeship Model

College of Micronesia - FSM

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Abstract

Learners' engagement and motivation to learn computer networking concepts is challenging as many students find the subject too technical, boring, and lacking a sense of practicality (Chang, 2004; Sarkar, 2006). It is against this background that the IS280, Introduction to Networking, a second year sixteen-week online course has been designed. The course aims to prepare students for an academic and/or entry level career as computer networking professionals. It has been revamped to include principles of universal design for learning (UDL), the apprenticeship model, and micro-learning amongst others as part of the mini project for LTEC 632 with an emphasis on assuring threshold learning outcomes (TLOs) (Rountree, J., Robins, et al., 2013). Quality and regulatory frameworks such as the TLOs emphasize on minimum discipline knowledge, professional capabilities, and values expected from specific level of the program in a specified discipline. Students enrolled in this course will receive hand-on experience and gain an understanding of how network protocols work to achieve data communication. They will learn how to build, configure, and troubleshoot basic networking issues by using common network utilities.

Sarkar, N. (Ed.). (2006). *Tools for teaching computer networking and hardware concepts*. IGI Global.

8] K. Abe, T. Tateoka, M. Suzuki, Y. Maeda, K. Kono, and T. Watanabe, "An integrated laboratory for processor organization, compiler design, and computer networking," *IEEE Trans. Educ., vol. 47, no. 2, pp. 311–320, May 2004.*

Motivation for course design:

- Need for an additional year for ease of transition to sister institutions;

- Data collected from empathy process in round table discussions with students;

- Need to develop basic networking skills for ease of access to employment market.
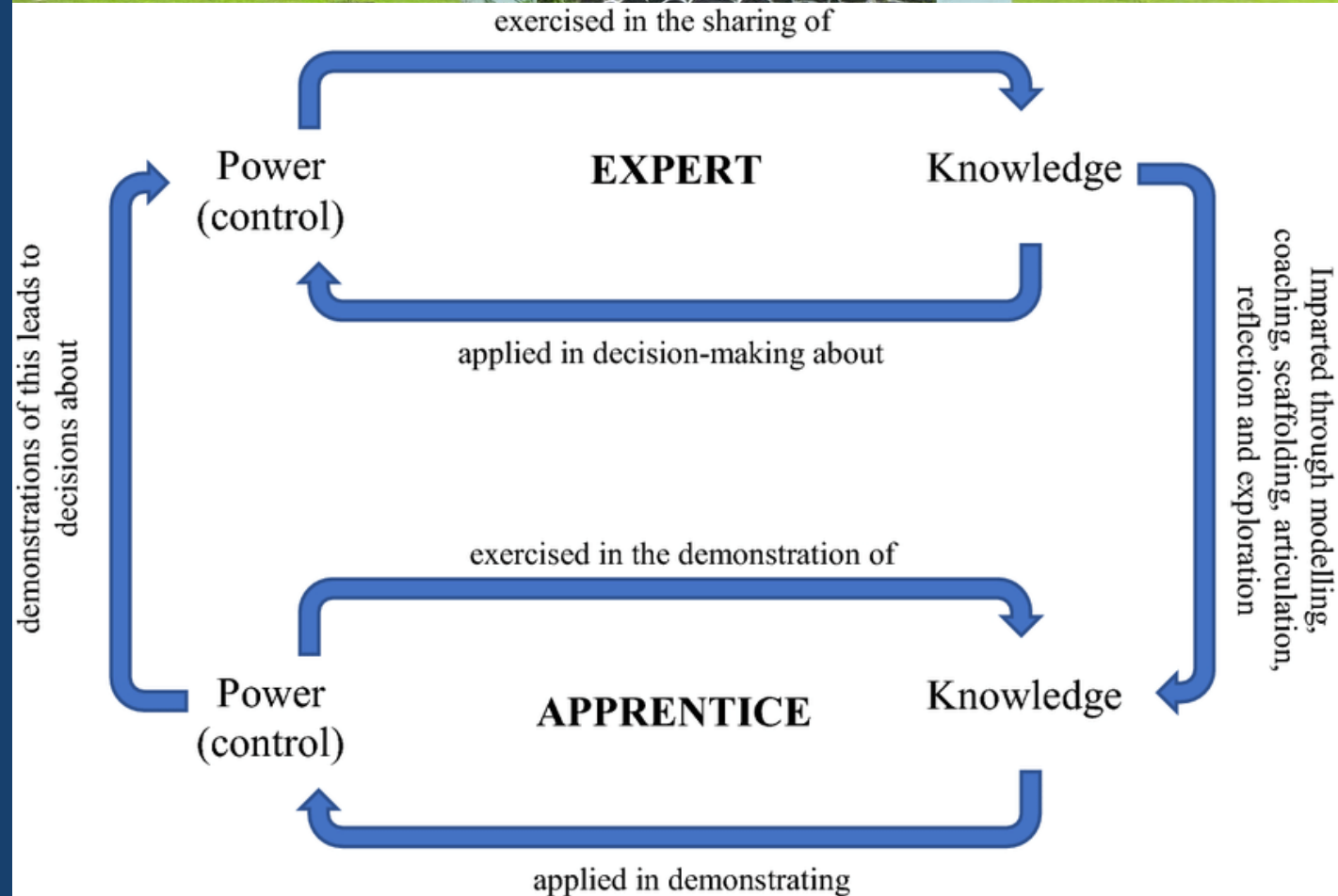
Source: Teo, T. W., & Tan, Y. L. K. (2020). Examining power, knowledge and power relations in a science research apprenticeship. *Cultural Studies of Science Education*, *15*(3), 659-677.

Course Description

This course introduces students to computer networking and network hardware fundamentals. At completion of this course, the student will understand how network protocols work to achieve data communication and the lifecycle of a protocol data unit (PDU) as it traverses a computer network.

Course rationale

- Prepare students for career as either computer networking professionals, academic, and/or practitioners,

- Provide training that meets the minimum threshold learning outcomes (TLOs).

Learning Objectives

1. Draw a block diagram of a computer and identify the different components of a computer system;
2. Outline the architecture of a network and how the various components work together to achieve data communication;
3. Describe how protocols handle data communications in a network and verify using network utilities;
4. Demonstrate an understanding of the role and function of the layers that form part of a specified protocol stack such as TCP/IP and how these layers work together to support applications such as the web;
5. Calculate subnet masks and addresses to fulfill network design requirements;
6. Build a simple network using routers and switches and perform basic configuration, verification, and troubleshooting of the network.

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Course Requirements

- Internet connection (DSL, L AN, or cable connection desirable)
- Access to a laptop, desktop, or tablet computer
- Access to COM FSM' s Schoology

Course Target Audience:

- Most students are aged between 18 to 26 years,

- 10 to 15% of adult learners and military veterans,

- 95% of the learners come from across islands of Chuuk, Yap, Kosrae, and Pohnpei.

Digital Access to Resources:

Digital equity is of utmost importance to this course's delivery and as such enrolled learners are required to at minimum have stable Internet connectivity and adequate computing resource (i.e., Desktop or Laptop computer). To best prepare learners, both computer literacy and introductory programming are prerequisites for this course. The goal of the course is to produce graduates with a fundamental grasp of networking concepts and an actualized appreciation of the necessary skills required to configure and troubleshoot a simple computer network.

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Week	Topics	Reference	Assessment
1	Introduction to a Computer System	Class notes	Laboratory Practical 1
2 – 3	Introduction to Networking	Chapter 1[1.4-5] Class notes; Lab Manual	Summative Assessment 1
4 – 6	Data Communications	Chapter 1[1.2-3]; Chapter 3[3.1-3]; Chapter 4[4.1-4]; Chapter 6[6.1-2]; Chapter 11[11.1]; Class notes	
7	Revision Week	Week 1 – 6	Summative Assessment 2
8 – 9	Protocol Architecture and Internet-based Applications	Chapter 2[2.1-5]; Class notes	Laboratory Practical 2
10 – 12	IP Addressing and Subnetting	Class notes; Chapter 18	Tutorial 1
13	IP Addressing and Subnetting Tutorial		Tutorial 2
14	Revision Week	Week 8 – 12	Midterm Exam
15	Network configuration and Troubleshooting	Lab Manual	Laboratory Practical 3
16	Revision week		
17			Final Exam

Assessment Strategies & Measures

- **Class tests** are either summative or ipsative assessments,

- **Laboratory Practice** revised to use the apprenticeship model,

- **Tutorial tests** for calculations tied to IP Addressing and subnetting

Practical Skill Assessment

Score	Description
10	Student can complete all tasks assigned without error
7 – 9	Student can complete all tasks assigned with less error
4 – 6	Student can complete partial tasks assigned with a few errors
1 – 3	Student can complete partial tasks assigned with more errors
0	Student shows no response/task not attempted

Generic Skill Assessment

Score	Description
30 – 21	Student participates actively in completing tasks assigned and demonstrate an understanding of professional ethics, responsibilities, and norms of electrical and electronic engineering practices
20 – 15	Student participates partially in completing tasks assigned and demonstrate an understanding of professional ethics, responsibilities but did not show the norms of electrical and electronic engineering practices
14 – 10	Student participates actively in completing tasks and demonstrate an understanding of professional ethics but did not show the responsibilities and norms of electrical and electronic engineering practices
9 – 1	Student participates partially in completing tasks assigned but did not demonstrate an understanding of professional ethics, responsibilities, and norms of electrical and electronic engineering practices
0	Student shows no participation at all in completing tasks assigned.

Evaluation of Substantive & Regular Interactions

Hybrid course delivery due to inherent issues with digital equity

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COM-FSM   COURSES   GROUPS   RESOURCES   TOOLS

Student Profile — Jean-Pierre Lukusa

Quick Links: Search, messaging and calendar

Intro. To Networking: IS 280/1 - National Campus
College of Micronesia-FSM

Add Materials ▾   Options ▾   All Materials ▾   Notifications

Course Options

Materials
- Updates
- Gradebook
- Grade Setup
- Mastery
- Badges
- Attendance
- Members
- Analytics
- Workload Planning
- Conferences
- Dropout Detection

Information

Grading period
Spring 2022

Location
MWF 2:10PM-4:00PM
Networking Lab

Meeting days
Mon Wed Fri

Meeting time
2:10 PM to 4:00 PM

Welcoming Letter

How do I join a Conference?

DATA AND COMPUTER COMMUNICATIONS

IS280_Online_Syllabus.pdf 283 KB

Assessments

Pre-Lab Activity: Introduction to Packet Tracer

You'll Learn These Core Skills (10 hours Independent Learning):
- Simulate data interactions traveling through a network.
- Visualize the network in both logical and physical modes.
- Apply skills through practice, using labs and Cisco Packet Tracer activities.
- Develop critical thinking and problem-solving skills.

Part 1: Week 1 to 3

Introduction to a Computer System: Von Neumann architecture. Components: Hardware – input, output, processing, and storage. Software – application, system, and utility; and Humanware – Overview of End-user Computing (EUC) and its classification.	Class notes
Introduction to Networking: Contrasting Networks and Networking. Networks – history, architecture, and function. Data transmission media – guided vs unguided media. Cable wiring schemes. Network Components. Types of network – LANs, MANs, PANs and WANs. Network Topologies. Internet, Ethernet, Extranet and Intranet.	Chapter 1[1.4-5] Class notes Lab Manual

Upcoming - 12   Add Event

Sunday, February 13, 2022
LAB 01: Mapping the Internet and Configuring Basic Router Settings with IOS CLI 11:59 pm

Friday, February 18, 2022
Test 02 11:59 pm

Friday, February 25, 2022
Tutorial 02: CIDR vs VLSM: UNDERSTANDING SUBNETTING AND SUPERNETTING 11:59 pm

Sunday, February 27, 2022
LAB 02: Building Straight-Through and Crossover UTP Cables 11:59 pm

Sunday, March 13, 2022
LAB 03: Install and configure Network Devices: HUB, Switch and Routers 11:59 pm

Friday, March 18, 2022
Test 03 11:59 pm

Sunday, March 20, 2022
LAB 04: Configure VLANs and Trunking on Cisco Routers and Switches 11:59 pm

Graded Assessment Schedule

Main Navigation Links

Learning Resources

Course Delivery Info

Thank You