

The Teaching of Telecommunications:
What Students Know and What They Think They Know

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Introduction

There exists an enormous amount of telecommunication products and applications that surround in our daily lives. Telecommunications is a large part of the information technology environment. As the information technology environment rapidly changes, this poses a challenge not only for Management Information Systems (MIS) managers, but also for academicians (Maier, Clark, and Remington, 1998). Within this environment some may be persuaded to believe that understanding telecommunication technology is second nature to many in our modern society, especially to those in colleges and universities studying a business curriculum. But the actual level of knowledge and the perceived level of knowledge of telecommunication issues may actually differ widely. This difference of perceived knowledge and actual knowledge may create a false sense of understanding for these students. Therefore, two key questions are: What do students know? What do they think they know? The answer to these questions may assist educators in helping students become better prepared for challenges in the future.

Students enrolled in a beginning telecommunications course in a small southeast university completed two separate inventories: a telecommunications knowledge inventory and a telecommunications perceptions inventory. The knowledge inventory was given in a pre- and post-test environment to investigate what the students actually know. However, in this manuscript, only the post-test knowledge scores were analyzed. The perception inventory was given at the end of the course to investigate the students' perceived telecommunication knowledge. Therefore, this study investigated students' actual telecommunications knowledge and their perceived telecommunications knowledge.

Purpose of Study

To examine the status of students' telecommunications knowledge and perception, this study investigates students in a telecommunications course taught within a college of business setting. The introductory telecommunications course gives students an opportunity to investigate specific topics of telecommunications such as hardware, protocols, standards, network infrastructures, etc. Many times students have little exposure to the subject matter.

As faculty in the area of Business Information Systems, it is our goal to prepare students to actively join the ranks of qualified Information Systems (IS) professionals. To accomplish this objective we must investigate students' knowledge and perceived knowledge to adjust the telecommunications course content accordingly. The purpose of this study was to answer the two following research questions: 1) What is the students' actual telecommunications knowledge? and 2) What do the students perceive to be their telecommunications knowledge?

Review of Literature

As this study deliberately uses two different instruments to assess students' telecommunications

knowledge and perception of knowledge, the following literature supports this research. Student perceptions versus student knowledge can be beneficial information for the instructor as well as the student. Students need to be able to recognize what they believe they know, their perception, and be able to demonstrate what they know, their knowledge. As noted by Bednarz (1997), "What students perceive is a function of what they know" (1).

As students develop their knowledge of any given subject, the instructor must acknowledge what the students know to be able to individualize the instructional process. Individualizing instruction many times distinguishes between the novice and experienced teacher (Eklund, 1998). As the on-line environment becomes popular and effective for many classes, many times the students do not 'appear' in class and the instructor must provide instruction via the Internet or other viable options. However, it is important to recognize that "the classroom is still the most basic meeting ground between faculty and students and continues to be a critical arena in which learning takes place" (Senter, 1995).

With this in mind, investigating the students' perceptions and knowledge is a necessary step in keeping content current in any classroom. This perspective is supported by Ives and Rubin (1993) where they suggest that as companies continually re-evaluate their IT needs, academics should design appropriate IS undergraduate curricula. Of the nine predominant MIS (Management Information Systems) areas recommended by the committee to design a IS undergraduate curriculum (IS'95), the area of telecommunications was selected.

The selection of telecommunications for this investigation is supported by the work of Lee, Trauth, and Farwell (1995), where they reported that IS practitioners have identified telecommunications as one of the top two areas of concern relevant to MIS skills. Additionally, the significant frequency of telecommunication related items in MIS job descriptions supports the selection of telecommunication (Brancheau, Janz, and Wetherbe, 1996).

Research Questions

The specific questions of this research are based on two views of telecommunications knowledge. These perspectives are: 1) What is the level of students' telecommunications knowledge? 2) What do the students perceive to be their telecommunications knowledge?

Methodology

The research questions were addressed by the administration of two telecommunications instruments: 1) the knowledge instrument and 2) the perception instrument. Two course sections of telecommunications students (n = 38) were participants in this study. The first course section completed the inventories in the Fall 2001 semester and the second class section completed the inventories in the Spring 2002 semester.

The development of the knowledge instrument was based on end of the chapter questions from the course textbook entitled Network + Guide to Networks (Dean, 2002). The questions were

randomly selected from the end of the chapter questions from 15 chapters. There were a total of 100 multiple-choice questions selected. This instrument was given in a pre- and post-test setting and the post-test scores were analyzed to determine what the students had learned upon the completion of the course.

The pre- and post-test method was utilized to help the instructor investigate what the students were learning and where there were weaknesses in the learning process. As noted by Atkinson and O'Connor (1999) multiple-choice questions also have the potential to serve as a learning aid. The students are able to see their growth and weak areas by investigating the questions and their scores on the pre- and post-tests. As noted by the NWREL's Comprehensive Center (2002), pretest/posttest models are very feasible in school settings.

The perception instrument used in this study is based on a previously published construct used to measure the teaching of telecommunications management. This construct consist of five dimensions; 1) Networks and Infrastructure, 2) Hardware and Software, 3) Management and Skills, 4) Performance and Security, and 5) Standards and Protocols (Turner, Sankar, and Rainer, 1999).

Based on the work of Couger, Davis, Dologite, Feinstein, Gorgone, Jenkins, Kasper, Little, Longenecker, and Valacich (1995), the original construct contained 11 factors establishing the base of knowledge deemed to be important to practitioners in telecommunications management (Couger et. al., 1995). This listing was augmented with the work of other IS telecom researchers, such as Brancheau, Janz, and Wetherbe (1996) and Lee, Trauth, and Farwell (1995). This 11 factor construct was subjected to reliability and content validity testing prior to the first administration of the instrument. Construct validity was tested utilizing an exploratory factor analysis. A varimax rotation method of factor analysis was applied to each of the categories, resulting in a five factor model containing 100 specific telecommunications items (Nunnally, 1967).

Based on the exploratory factor analysis of the telecommunication instrument developed by Turner et. al. (1999), five dimensions were established representing the telecommunications construct. The 100 multiple-choice post-test questions were reviewed and categorized in one of the five dimensions. This then allowed for further investigation of the students actual knowledge versus their perceived knowledge in these five areas. The inventory of questions assigned to each dimension ranges 11 to 26 items.

Findings

Research question one investigated the actual telecommunications knowledge of the participants. With this pre- and post-test situation, the participants were given the pre-test at the beginning of the semester and given the same test as a post-test at the end of the semester. Research question two investigated the students' perceptions of their telecommunications knowledge. Participants were given the perception inventory at the end of the semester. The findings of the post-test scores representing the students' telecommunications knowledge are displayed in column one, and the means for the students' perceptions are listed in column two of table one.

Table 1		
Dimensions of Telecommunications	Students' Telecommunications Knowledge	Students' Perceptions of Their Telecommunications Knowledge
Networks & Infrastructure	4.04	3.01
Performance & Security	3.70	2.90
Management & Skills	3.52	2.95
Standards & Protocols	3.49	2.82
Hardware & Software	3.39	2.53

The perceptions inventory gave the students the opportunity to evaluate each item within the five dimensions of the telecommunications instrument with a response of: "I have developed the following level of knowledge in the areas below: (1) very low (2) low (3) moderate (4) high (5) very high". The value of one represents the lowest of the above response scores, and five represents the highest response score. The responses for the post-test telecommunications instrument utilized conventional test results. The percentage of correct answers of a given dimension are represented by a range of scores where the value of five reflects a perfect score.

The variance between knowledge and perception of knowledge ranges from .57 to 1.03. For all dimensions, knowledge of telecommunications is higher than perceived knowledge. It is most evident in the Network and Infrastructure dimension with a difference of 20.6 percent. The smallest difference between knowledge means and perceptions means is in the Management and Skills dimension with a difference of 11.4 percent. Both knowledge and perceived knowledge were highest in Networks and Infrastructure and the lowest two dimensions in knowledge and perception were Standards and Protocols and Hardware and Software respectively. Ranking of Performance and Security and Management and Skills varied between knowledge and perceived knowledge. However, the reported variance between the knowledge and perception for these two dimensions is .05 and may not be statistically significant.

As previously referenced, Bednarz (1997) stated, "What students perceive is a function of what they know" (1). This study gave the students the opportunity to see data that represents what they know in conjunction with what they perceive they know. The results indicate that the students know more than they perceive they know. This may be a direct result of the complex nature of the telecommunications environment, where technology is developing and expanding at an exponential rate.

Limitations

The limitation of the sample size restricts the scalability and generalization to larger populations. However, it is essential for colleges and universities to sample their own students to investigate the knowledge and perceived knowledge of their students in order to improve upon their curriculum.

Future Research

The following are suggestions for future research.

1. Similar research should occur in various IS courses to keep the curriculum current and acknowledge the strengths and weaknesses in one's area of study.
2. A follow-up study in similar areas should occur to see if future studies result in the similar findings.

References

- Atkinson, R. and O'Connor, R. (1999). The application of multiple choice questions in a computer environment as a method of learning rather than assessment. Retrieved September, 2002 from MCE Working Papers. Dublin City University.
www.computing.dcu.ie/research/CA_Working_Papers/MCE/wp99.html
- Bednarz, S. W. (1997). What is good pedagogy? Retrieved August 23, 2002 from the Texas A & M University, College of Geosciences web page <http://geog.tamu.edu/sarah/pedactive/pedagogy.html>.
- Brancheau, J., Janz, B., and Wetherbe, J. (1996, June). Key Issues in Information Systems Management: 1994-1995 SIM Delphi Results, MIS Quarterly, 20 (2), 225-242.
- Brancheau, J. C. and Wetherbe, J. C. (1987, March). Key issues in information systems management. MIS Quarterly, 11 (1), 23-45.
- Couger, J., Davis, G., Dologite, D., Feinstein, D., Gorgone, J., Jenkins, G., Kasper, G., Little, J., Longenecker, H. and Valacich, J. (1995, September). IS'95: Guidelines for undergraduate IS curriculum. MIS Quarterly, 19 (3), 341-356.
- Dean, T. (2000). Network + Guide to Networks. Thompson Learning - Course Technology Cambridge, Ma.
- Eklund, J. (1998). The role of student knowledge in the design of computer-based learning environments. Educational Technology & Society, 2 (2). Discussion from The University of Technology, Sydney, Australia.
- Ives, B. and Rubin, R. (1993, December). Educating Tomorrow's Business Leaders About Information and Technology. MIS Quarterly, 17 (4), ii-iv.
- Lee, D., Trauth, E. M., and Farwell, D. (1995, September). Critical thinking skills and knowledge requirements of IS professionals: A joint academic /industry investigation. MIS Quarterly, 19 (3), 313-340.
- Maier, J. L., Clark, W. J., and Remington, W. S. (1998). A longitudinal study of the management information systems (MIS) job market. Journal of Computer Information Systems, XXXIX, (1), 37-42.
- NWREL's Comprehensive Center (2002). Impact Evaluation. Retrieved September 16, 2002 from the NWREL's Comprehensive Center Region X web site: www.nwrac.org/whole-school/impact_c.html.
- Nunnally, J. (1967). Psychometric Theory. New York, NY: McGraw-Hill.
- Senter, M. S. (1995). Classroom assessment techniques: A handy handbook. Teaching Enrichment, 10

(1).

Trauth, E. M., Farwell, D., and Lee, D. (1993, September). The IS expectation gap: Industry versus academic preparation. MIS Quarterly, 17 (3), 293-307.

Turner, D. E., Sankar, C. S. and Rainer, R. K. (Winter, 1999). The teaching of telecommunications management: Expectations and delivery. Journal of Computing Information Systems, XXXIX (2), 81 - 92.