Does the Instructor's Experience as a Practitioner Affect the Purpose and Content of the Undergraduate Systems Analysis and Design Course?

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Abstract

This paper reports the results of a survey and follow up interviews that were administered to instructors of the undergraduate systems analysis and design course, a core course of the Information Systems curriculum. The goal of this research was to learn if the background of the instructor, in terms of industry experience, affects the purpose and content of the course. The survey results indicate that there are significant differences between instructors with no practitioner background and those with prior industry experience.

Keywords: IS research toward educators, pedagogy, IS undergraduate curriculum, Teaching Systems Analysis and Design

1. INTRODUCTION

In 2005, Burns and Klashner researched and wrote a short anecdotal conference article that compared and contrasted the content of the system development courses in the Information Systems programs of sixty colleges and universities (Burns & Klashner 2005). In that article, course materials were examined to determine what textbooks and system development methodologies were being covered in system development courses (Burns & Klashner 2005).

As a follow up, in 2010, Burns conducted a study that delved much deeper into this research area (Burns 2011). Significant data was collected from instructors teaching systems analysis and design in colleges and universities around the world. An initial paper reporting the findings from that study was presented at the ISECON 2010 conference, published in the proceedings, and later published in the Information Systems Educator Journal (ISEDJ) in 2011 (Burns 2011).

The purpose of this paper is to further that research. This time, the research question is: "Does the background of the instructor (in terms of industry experience) affect the purpose and course content of the systems analysis and design course?"

2. BACKGROUND

Peter Keen, at the first International conference on Information Systems (ICIS) in 1980, defined IS as an "applied" discipline (Keen 1980). Applied disciplines have two primary objectives; to increase knowledge (theory) and to improve practice (Phillips 1998). Furthermore, applied disciplines use theory from other "reference" disciplines and apply it to solve practical problems rather than having any distinct theoretical base of their own (Baskerville and Myers 2002, Moody and Buist 1999).

In the three decades since that first ICIS, there have been those who have embraced the argument that IS is an applied discipline and those who have not. Those who embrace it,

argue that IS should continue to stay rooted as an applied discipline and, as such, should emulate other applied fields such as medicine, engineering, and architecture (Moody and Buist 1999). Others argue that the time has come for IS to become a reference discipline of its own (Baskerville and Myers 2002). As such, its research should embrace its theoretical underpinnings and serve as a foundation for other disciplines, including those who once served as reference disciplines for IS. However, even those in the latter camp would have to agree that there is a measure of applied practice that will always exist in the IS field.

The debate of theory versus practice extends beyond the arena of research and into the arena of IS education as well. Prior research has shown that IS instructors are divided in their opinions as to whether the focus of IS education should be on theory or practice (Burns 2011). However, it appears that there is little debate as to the importance of practical experience for the instructors themselves. The IS 2010 Curriculum Guidelines state that "The program is enhanced significantly when faculty acquire practical experience in the profession" (Topi, Valacich, Wright, Kaiser, Nunamaker, Sipior, and de Vreede 2010). Looney et al. determined that IS faculty need both academic training and practical experience in order to be effective IS teachers (Looney and Akbulut 2007).

A point of distinction can be made between IS and other applied disciplines. While the 2010 IS Curriculum Guidelines strongly suggest that faculty acquire practitioner experience, they do not mandate it. In other fields of applied discipline, instructors are *required* to have practical experience. Medical academics must do a minimum amount of clinical practice to retain accreditation and get promoted (Moody and Buist 1999). The ABET accreditation criteria for university construction programs stipulate that they must include at least one faculty member who has had full-time experience and decision- making responsibilities in the construction industry. The American Council for Construction Education Document 103 states, "Evaluation of faculty competence must recognize appropriate professional experience as being equally as important as formal educational background" (McCuen 2007).

Clinebell and Clinebell discuss the tension between academic rigor and real world relevance in business education (Clinebell and Clinebell 2008). This is pertinent because most IS programs are housed in the school of business in colleges and universities and IS is generally considered to be a business discipline. Clinebell et al., discuss how the pendulum in business education has swung from an emphasis on practice to academic rigor and now back to practice again. A shortage of business PhD's to teach business courses and criticism of inadequate real world preparation of students has encouraged business schools to hire more practitioners to teach in their programs (Clinebell and Clinebell 2008). There are some who feel that this practice may not be in the best interest of business programs and their students (Fowler 2005).

The crux of the discussion, for this research, is in determining the differences between instructors with extensive practitioner backgrounds and those who do not. Prior research has shown that faculty with industrial experience spend a greater percentage of their time on teaching above and beyond their work assignment, are more likely to teach undergraduates, are less likely to think about changing jobs to spend more time on research, and are less likely to believe that publishing should be the primary criterion in promotion and tenure decisions (Fairweather and Paulson 1996).

The purpose of this paper is to further this research. This time, the research question is: "Does the background of the instructor (in terms of industry experience) affect the purpose and course content of the systems analysis and design course?

3. RESEARCH METHODOLOGY

This research was conducted using a "grounded theory" approach. Grounded theory was developed by the sociologists Barney Glaser and Anselm Strauss in the 1960's. In the grounded theory approach, conclusions are drawn and theories are produced by analyzing a body of data. In essence, the theories that are produced are "grounded" in the data (Glaser & Strauss 1967).

For this study, the process began by analyzing the current body of literature on teaching the SA&D course. This allowed the researchers to create a survey instrument that would be used to ask questions about the delivery of the

SA&D course and the demographical background of the instructors and institutions that delivered those courses. The survey included mostly closed end questions (which are listed in the results section below) and a few open ended questions.

A list that contained approximately 1500 names of IS instructors was compiled and an email was then sent to every person on the list. The email explained the purpose of the study and provided a link that the subject could click on to complete the questionnaire. Approximately 172 people chose to participate in the study. Once the initial results had been tabulated, a follow up email was sent to all of the participants in order to gain a deeper understanding of their responses.

For this paper, "practitioners" are defined as those respondents who have had significant practitioner experience. Respondents were asked to indicate whether they had no, less than five years, five to ten years, or greater than ten years of practitioner experience. Significant practitioner experience was defined as having more than five years. Therefore the respondents were split into two categories; those with less than five years of practitioner experience and those with five or more. The data collected showed that the respondent pool was almost evenly divided between the two categories.

4. RESULTS

In this section, the data that was collected is summarized and presented as a series of tables. The survey questions are included to provide additional clarity. Each table has four columns or categories. The "P" column shows the practitioner responses, the "NP" column shows the non-practitioner responses and the "All" column shows the aggregated responses of both categories. The lowercase "p" column shows the probability calculated from a two tailed z-test. A "p" of less than .05 is considered statistically significant.

Question 1: How do you determine what subjects and material to cover in your Systems Analysis & Design course? (Multiple Answers Allowed)

Most often chosen combination:

Based on industry experience, feedback, or trends, the textbook, and academic literature

Table 1 How Instructors Choose their SA&D Course Content

	All	P	NP	*p*
Based on industry experience, feedback, trends	83%	97%	68%	*.01*
Based on the textbook	70%	67%	76%	*.33*
Based on academic literature	52%	57%	48%	*.45*
Based on academic suggested course outline	24%	38%	18%	*.23*
Mandated by college or department	12%	6%	18%	*.56*
Other	13%	12%	13%	*.95*

Question 2: What textbook(s) do you use in your course?

Table 2 Textbooks Used in SA&D Courses by Percentage of Respondents

Textbook Used	All	P	NP	*p*
Whitten & Bentley, "Systems Analysis and Design Methods"	18 %	18%	20%	*NA*
Dennis, Wixom, & Roth "Systems Analysis & Design"	12 %	7%	15%	*NA*
Shelly, Cashman, & Rosenblatt, "Systems Design & Analysis"	11 %	14%	9%	*NA*
Satzinger, Jackson, & Burd: "Systems Analysis and Design in a Changing World"	6%	9%	2%	*NA*
Dennis, Wixom, & Tegarden: "Systems Analysis and Design with UML"	6%	6%	5%	*NA*
Hofer, George, & Valcich: "Modern Systems Analysis and Design"	6%	4%	7%	NA
Valacich, George, &	6%	4%	9%	NA

Hoffer: "Essentials of Systems Analysis and Design"				
Own Material	5%	7%	2%	NA
Whitten & Bentley: "Introduction to Systems Analysis and Design"	4%	5%	2%	NA
Kendall & Kendall: "Systems Analysis and Design"	4%	9%	0%	NA
George, Batra, Valacich, & Hoffer: "Object-Oriented Systems Analysis and Design"	4%	0%	7%	NA
Shelly & Rosenblatt: "Systems Analysis & Design"	3%	5%	0%	NA
Marakas: "Systems Analysis & Design: An Active Approach"	3%	0%	4%	NA
DeWitz: "Systems Analysis and Design and the Transition to Objects"	2%	4%	0%	NA
Harris, "Systems Analysis and Design for the Small Enterprise"	2%	2%	2%	NA
Larman: "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development"	2%	0%	4%	NA
Other	4%	12%	14%	NA

Question 3: How did you determine what textbook(s) to use in your Systems Analysis & Design course? (Multiple Answers Allowed)

Table 3 How Respondents Determined What Textbook to Use

	All	P	NP	*p*
Based on what I feel the course should cover	73%	70%	76%	*.51*
Based on industry experience, feedback, or trends	39%	52%	26%	*.05*
Suggested by a colleague	18%	16%	19%	*.85*
Based on an academic suggested textbook	12%	13%	10%	*.86*
Mandated by college or department	4%	6%	2%	*.86*
Use my own materials	2%	0%	3%	*.71*
None of the above	2%	0%	3%	*.71*
Authored the book	2%	3%	0%	*.71*
Other	14%	12%	16%	*.81*

Most often chosen combination:

Based on industry experience, feedback, or trends and on what I feel the course should cover

Question 4: How is your Systems Analysis & Design Course delivered?

Table 4 How SA&D Course is Delivered

	All	P	NP	*p*
Traditional classroom	78%	73%	80%	*.41*
Hybrid (part classroom/part online)	11%	14%	6%	*.68*
Online	7%	3%	11%	*.73*
Some sections online and some in traditional classroom	2%	7%	0%	*.64*
Other	2%	3%	3%	*0*

Question 5: What phases of the systems development life cycle are covered in your Systems Analysis & Design course?

(Multiple Answers Allowed)

Table 5 Phases Covered in SA&D Course

	All	P	NP	*p*
Initiation	85%	91%	77%	*.04*
Planning	92%	93%	92%	*.83*
Analysis	98%	100%	98%	*.24*
Design	93%	97%	89%	*.07*
Implementation	75%	78%	73%	*.56*
Maintenance	52%	61%	45%	*.18*
None of the above	0%	0%	0%	*0*
Other (testing, project management, non-traditional)	7%	9%	5%	*.83*

Most often chosen combination:

Initiation, Planning, Analysis, Design, Implementation, and Maintenance

Question 6: What system development approaches do you cover in your Systems Analysis & Design Course?

Table 6 Approaches Covered in SA&D Course

	All	P	NP	*p*
Both traditional and object oriented	53%	66%	39%	*.03*
Traditional	25%	20%	31%	*.47*
Object Oriented	15%	5%	25%	*.41*
Traditional, object oriented, and other (Agile, RAD, JAD, etc.)	5%	6%	3%	*.88*
Other (Method Engineering, Short life cycle, prototyping)	2%	3%	2%	*.96*

Question 7: What system development methodologies or models do you cover in your Systems Analysis & Design Course? (Multiple Answers Allowed)

Table 7 Methodologies Covered in SA&D Course

	All	P	NP	*p*
Waterfall	80%	77%	81%	*.61*
Boehm's Spiral	22%	22%	21%	*.95*
Prototyping	75%	74%	75%	*.91*
Object Oriented	64%	64%	63%	*.92*
Rapid Application Development	75%	84%	63%	*.02*
Extreme Programming	35%	32%	37%	*.72*
Scrum	12%	12%	13%	*.95*
None of the above	0%	0%	0%	*1*
Other	10%	10%	10%	*1*

Most often chosen combination:

Waterfall, Prototyping, Object Oriented, and Rapid Application Development

Question 8: What project feasibility measurement concepts and techniques do you cover in your Systems Analysis & Design Course? (Multiple Answers Allowed)

Table 8 Feasibility Concepts Covered

	All	P	NP	*P*
Economic	84%	86%	84%	*.77*
Technical	89%	90%	87%	*.61*
Organizational/ Cultural Feasibility	71%	74%	69%	*.59*
Resource	56%	65%	46%	*.11*
Scheduling	63%	64%	61%	*.78*
Cost/Benefit Analysis	74%	71%	75%	*.66*
Return on Investment	62%	68%	56%	*.26*
None of the above	7%	4%	11%	*.73*
Other	5%	6%	2%	*.86*

Most often chosen combination:

Economic Feasibility, Technical Feasibility, Organizational/Cultural Feasibility, Resource Feasibility, Scheduling Feasibility, Cost/Benefit Analysis, Return on Investment

Question 9: What project management tools/techniques do you cover in your Systems Analysis & Design Course? (Multiple Answers Allowed)

Table 9 Project Management Tools/Techniques Covered

	All	P	NP	*p*
Microsoft Project	44%	49%	42%	*.59*
Work Breakdown Structures	30%	30%	32%	*.89*
GANTT Charts	66%	76%	58%	*.07*
PERT Charts	56%	70%	43%	*.02*
Critical Path	51%	61%	42%	*.12*
None of the above	19%	9%	30%	*.29*
Other	5%	4%	5%	*.95*

Most often chosen combination:

Microsoft Project, GANTT Charts, PERT Charts, Critical Path

Question 10: What information gathering techniques do you cover in your Systems Analysis & Design Course? (Multiple Answers Allowed)

Table 10 Information Gathering Techniques Covered

	All	P	NP	*p*
Interviews	93%	91%	94%	*.53*
Questionnaires	84%	86%	81%	*.48*
Observation	77%	74%	79%	*.55*
Heuristic Analysis	17%	22%	13%	*.59*
Protocol Analysis	14%	20%	6%	*.52*
Document Review	77%	84%	67%	*.04*
JAD	58%	62%	52%	*.38*
None of the above	3%	3%	3%	*1*
Other	7%	6%	7%	*.95*

Most often chosen combination:

Interviews, Questionnaires, Observation, Document Review, JAD

Question 11: What diagramming techniques do you cover in your Systems Analysis & Design Course? (Multiple Answers Allowed)

Table 11 Diagramming Techniques Covered in SA&D Course

	All	P	NP	*p*
E-R Diagrams	82%	90%	73%	*.02*
Data Flow Diagrams	83%	74%	91%	*.02*
Flowcharts	30%	44%	16%	*.11*
Structure Charts	39%	50%	28%	*.13*
Database Diagrams	33%	40%	25%	*.32*
UML Class Diagrams	52%	54%	50%	*.74*
UML Use Case Diagrams	54%	54%	53%	*.93*
UML Activity Diagrams	34%	34%	34%	*1*
UML Communication/Collaboration Diagrams	23%	18%	28%	*.53*
UML State Machine Diagrams	21%	22%	20%	*.90*
Package Diagrams	9%	7%	11%	*.82*
None of the above	2%	3%	2%	*.96*
Other	5%	3%	6%	*.87*

Most often chosen combination:

E-R Diagrams, Data Flow Diagrams

Question 12: What other system development concepts and techniques do you cover in your Systems Analysis & Design Course?

(Multiple Answers Allowed)

Table 12 Other System Development Concepts and Techniques Covered

	All	P	NP	*p*
Systems Development Life Cycle	91%	91%	90%	*.85*
Interface Design	68%	72%	65%	*.47*
Forms Design	55%	59%	51%	*.49*
Database Design	58%	69%	47%	*.05*
Network Design	21%	24%	18%	*.70*
Buy vs. Build	63%	67%	59%	*.45*
Object and Class Design	42%	42%	42%	*1*
Use Case Descriptions	62%	65%	60%	*.64*
UML	39%	42%	36%	*.66*
Modular Concepts (cohesion and coupling)	33%	36%	30%	*.68*
People and Resistance Issues	54%	52%	56%	*.73*
Scope Creep	58%	58%	58%	*1*
Pseudo code Techniques	20%	35%	5%	*.28*
Structured English	28%	26%	30%	*.79*
None of the above	1%	1%	0%	*1*
Other	7%	6%	8%%	*.91*

Most often chosen combination:

Systems Development Life Cycle, Interface Design, Forms Design, Database Design, Network Design, Buy vs. Build, Object and Class Design, Use Case Descriptions, UML Modular Concepts (cohesion and coupling), People and Resistance Issues, Scope Creep, Pseudo code Techniques

These next tables represent the answers given to a series of follow up questions that were administered to the survey respondents.

Question 13: Is your course delivered in one course or two**?**

Table 13 Number of Courses

	All	P	NP	*p*
One	76%	89%	67%	*.01*
Two	24%	11%	33%	*.24*

Question 14: Do you have a course project?

Table 14 Respondents with Course Project

	All	P	NP	*p*
Yes	96%	94%	96%	*.61*
No	4%	6%	4%	*.91*

Question 15: Do you use a real world or simulated project?

Table 15 Real or Simulated Project

	All	P	NP	*p*
Real	58%	39%	70%	*.01*
Simulated	42%	61%	30%	*.02*

Question 16: If real world, how do you find the projects?

Table 16 How Projects Are Found

	All	P	NP	*p*
Instructor finds projects	46%	60%	35%	.06
Students find projects	54%	40%	65%	.04

Question 17: Do you split students into groups or do all students work on one project

Table 17 How Students Collaborate On Project?

	All	P	NP	*p*
Split into groups	88%	80%	90%	*.14*
Students work individually or together	11%	20%	10%	*.57*

Question 18: Does the course project extend beyond the course and one semester

Table 18 Does Course Extend Beyond One Semester?

	All	P	NP	*p*
Yes	21%	0%	30%	*.01*
No	79%	100%	70%	*.01*

Question 19: In your SA&D course, do you use more lecture or hands-on activities?

Table 19 Lectures or Hands On

	All	P	NP	*p*
Lecture	24%	28%	22%	*.69*
Hands on	13%	0%	22%	*.01*
About Equal	62%	72%	56%	*.13*

Question 20: Do you feel that the purpose of a SA&D course should be to give students practical experience or theoretical foundation?

Table 20 Instructors Perception of the Purpose of the SA&D Course

	All	P	NP	*p*
Practical experience	4%	0%	7%	*.69*
Theoretical Foundation	2%	6%	0%	*.62*
Mostly Practical	29%	33%	26%	*.64*
Mostly Theory	24%	28%	22%	*.69*
Even Split	41%	33%	44%	*.42*

5. CONCLUSION

The results of this research seem to indicate that there are significant differences between practitioners and non-practitioners. The answer to the question of, "Does the background of the instructor (in terms of industry experience) determine the course content of the systems analysis and design course?" appears to be yes.

Question one asked instructors how they chose their SA&D course content. Not surprisingly, 97% of practitioners said that they did so based on industry experience. Non-practitioners were more likely to determine the course content based upon the textbook (although a significant number also use industry feedback and trends).

There appears to be little difference between practitioners and non-practitioners as to what textbook they use (question two) as both groups use many different textbooks, however, there are significant differences as to how they go about choosing the textbook (question three). Again, not surprisingly, practitioners are much more likely (52% to 26%) to use industry experience.

Non-practitioners are more likely to deliver their course in a traditional classroom or fully online setting. Practitioners are more likely to deliver their course in a hybrid format or to split their course sections between the classroom and online. While both practitioners and non-practitioners are likely to cover all phases of the systems development life cycle, practitioners are more likely (by a 14% margin) to cover the initiation phase. Perhaps industry experience has shown these instructors the importance of this phase.

Question six asked instructors what system development approaches they covered in their SA&D course. There are some significant differences between practitioners and non-practitioners here. Practitioners are much more likely to cover both the traditional and object-oriented approaches in their classes. Non-practitioners are much more likely to cover only the object-oriented approach and slightly more likely to cover only the traditional approach. Perhaps instructors with industry experience are more likely to have been exposed to both approaches and thus feel that it is important to cover them both in their class.

In regard to methodologies and models covered in the course, there is much similarity between practitioners and non-practitioners. The one area where there appears to be a significant difference is in the covering of rapid

application development (RAD). Practitioners are much more likely to cover RAD. This stands to reason given the fact that RAD, for many, is about circumventing the bureaucracy of theory and implementing a purely practical approach (Howard 2002).

Practitioners are more likely to cover resource feasibility when covering feasibility concepts and non-practitioners are slightly more likely to not cover any of the popular feasibility concepts. Under the category of project management tools/techniques (table 9), practitioners are much more likely to cover GANTT charts, PERT charts, and critical path concepts. Perhaps this is because practitioners have used these "hands on" tools in industry. Non-practitioners are much more likely to not cover any of the popular project management tools/techniques.

Question ten asked the instructors what information gathering techniques they covered. Instructors from both groups are equally likely to cover the popular techniques (interviews, questionnaires, observation, etc.); however practitioners were much more likely to cover document review and Joint Application Development (JAD). Again, these techniques were probably more likely to be encountered in industry.

When it came to diagramming techniques, practitioners were much more likely to cover the techniques associated with the traditional approach to systems development (E-R, flowcharts, structure charts, and database) with the exception of dataflow diagrams, which were much more likely to be covered by non-practitioners. Both practitioners and non-practitioners covered object oriented diagramming techniques about equally.

Other system development concepts and techniques are also covered equally by both practitioners and non-practitioners with the exception of "buy vs. build" and pseudocode techniques which are much more likely to be covered by practitioners.

Non-practitioners were much more likely to deliver their SA&D course as two courses and over multiple semesters (tables 13 and 18). However, this may be more a function of the program than the instructor. Non-practitioners were also much more likely to use a real world project in the course as opposed to a simulated project. Perhaps the practitioners are able to simulate a real world project they have worked on in the past. Not surprisingly, when using a real world project, practitioners were more likely to find the projects for the students as opposed to non-practitioners who let the students find the projects themselves.

Interestingly, non-practitioners were much more likely to use hands-on activities only in their courses when asked if they used lectures or hands-on. Practitioners were more likely to use about equal amounts of lecture and hands-on. A substantial number of both practitioners and non-practitioners use only lectures.

Finally, when asked if the purpose of the SA&D course should be theory or practice, approximately two-thirds of both practitioners and non-practitioners felt that there should be an even split between theory and practice or that the focus should be more practical than theory. Practitioners were slightly more likely to say that the focus should be more practical.

This research has shown that there is, indeed, a difference in perception and course content of the SA&D course when instructors have significant industry experience. Future research will focus on the content of the typical undergraduate SA&D course and its consistency with the skills, tools, and knowledge required in industry.

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