

Constructing Integrated Writing Assignments for the IS Curriculum

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ABSTRACT

Information Systems (IS) professionals must possess both strong technical skills and solid communication skills to advance their careers. Nelson (1992) and Merhout and Etter (2005) argue that IS faculty must take responsibility to help students improve their communications skills because these skills are essential in a rapidly changing technological environment. Interleaving writing assignments into IS courses is highly recommended within the IS 2002 Model Curriculum (IS02MC). This paper presents a series of integrated writing assignments—assignments designed to cover two or more listed learning units—that could be interleaved into the IS02MC courses.

Keywords: IS 2002 Model Curriculum, Writing assignments, Writing across the curriculum, Communication skills

1. INTRODUCTION

Liebowitz (2004) argues that communication skills, including possessing strong writing skills, are important to the long-term future of Information Systems (IS) professionals. Nelson (1992) and Merhout and Etter (2005), argue that IS faculty must take responsibility for creating future IS professionals that are critical thinkers with strong writing skills because these skills are needed by IS professionals to keep up in a rapidly changing technological environment. Weber (2004) suggests that future IS curricula must consist of two components: vocational subjects and technology transcending subjects. Vocational subjects “provide students with knowledge about and experience with current IS phenomena” (Weber 2004)—these types of skills are addressed in the new IS 2002 Model Curriculum (IS02MC). The content of the technology transcending subjects is “intended to be timeless” (Weber 2004); while not listed specifically by Weber, interpersonal and communications (writing) skills would generally be included in any list of these subjects.

The IS 2002 Model Curriculum addresses both the vocational and technology transcending subjects, however the learning units (LUs) of the courses in the IS02MC only address technical topic areas. The IS02MC states “all information systems students should be able to communicate effectively both orally and in writing” (Gorgone, Davis et al. 2003, pg. 12). The model curriculum maintains that communications skills—including general and technical

writing—developed through pre-requisites or should be interleaved with the IS courses (Gorgone, Davis et al. 2003). Therefore, assignments within IS courses need to possess a written component for students to develop these skills. Writing assignments interleaved into an IS course will increase student learning while developing their thinking skills in order to pose questions (necessary in requirements gathering), proposing hypotheses (necessary for solution development), gathering and analyzing data (needed for prototype development), and making arguments (needed for testing and evaluation) (Bean 1996). Additionally, writing assignments that are interleaved and integrated—that are designed to meet more than one learning objective—provide an instructor the opportunity to connect course topics and provide a student with a broader view of the course.

The major contribution of this paper is to provide IS educators with suggestions for interleaving integrated writing assignments into the courses in the IS02MC. Each proposed writing assignment is designed to encompass at least two of the stated learning units (LUs) from the courses within the model curriculum. The use of writing assignments in the IS02MC can accomplish two major objectives to: build and reinforce student written communication skills and increase the quality of the student learning experience.

The organization of this paper is as follows. Section two provides the motivation for this work; which is three-fold. First, the issue of increased student learning/reasoning due to writing assignments is addressed. Second, the literature on the importance of developing the interpersonal skills is

examined. Lastly, the literature on the effectiveness of writing assignment usage in other business disciplines—accounting, economics, finance, etc.—is discussed. The next two sections address two of the major challenges in creating writing assignments (Bean 1996): planning for and designing the assignment and grading and giving feedback. Section three focuses on the development of the specific writing assignments within the final nine curricular areas in the IS02MC (focusing on the IS major/minor) and section five discusses the use of checklists, rubrics, and grading scales as a means to provide feedback to students. The final section of this paper addresses conclusions and future work in this area.

2. MOTIVATION

“Maybe it’s time to redefine the ‘three R’s’—they should be reading, ‘riting, and reasoning. Together they add up to learning” (Zinsser 1988, pg. 22). Writing contributes to an improvement in thinking skills “because a person must mentally process ideas in order to write an explanation” (Zinsser 1988, pg. 208). The goal of all educators is “to plan how our students will engage in learning activities” (McKeachie 1986, pg. 23). Planning appropriate writing assignments has often been cited to aid progress toward this goal (McKeachie 1986; Bean 1996; Coffin 2003). Writing aids understanding and memory, as well as critical thinking skills (Bean 1996; Coffin 2003), because “writing is both a process of doing critical thinking and a product of communicating the results of critical thinking” (Bean 1996, pg. 3); this research has been affirmed by the writing-across-the-curriculum and writing-in-the-discipline movements (Anson, Schwiebert et al. 1993).

Information Systems professionals, as exemplified by the “systems analyst,” need solid analytical, technical, interpersonal (including writing), and managerial skills. “The primary role of a systems analyst is to study the problems and needs of an organization in order to determine how people, methods and information technology can best be combined to bring about improvements in the organization” (Valacich, George et al. 2004, pg. 14). In order to do an effective job the systems analyst must be a solid communicator (Misic and Graf 2004; Valacich, George et al. 2004).

Many employers criticize IS programs for producing graduates that lack adequate written communication skills (Liebowitz 2004). Misic and Graf (2004) assessed the major tasks of systems analysts and the skills—analytical, technical, communications and interpersonal—that are key in completing those tasks. Misic and Graf (2004) found that technical and communication skills were ranked evenly behind analytical skills by professionals. This study lists the top 35 tasks of utmost importance to systems analysts; many of these tasks have specialized writing components that could and should be interleaved in an IS curriculum. Miller and Luse (2004) further delineate and rank the necessary communication skills needed by IS professionals. These skills, including writing coherently and concisely, using words/terms correctly, and organization of ideas can be used as the basis for assessment of writing assignments. Jiang,

Klein et al. (2003) show that Information Systems success is influenced by the communication skills of IS professionals. IS professionals are expected to work with and communicate with business professionals to craft successful IS solutions to business problems {Surmacz, 2005 #53}. Information Systems personnel with solid communication skills would be at lower risk of having their job function outsourced {Feeney, 1998 #54}. Their ability to write effectively needs to be developed throughout their education {Hilson, 2002 #52}.

The educational literature on the use of writing assignments for enhancing the pedagogy of IS (and Computer Science) courses is limited. Most of literature (see Table 1) is focused on suggesting the types of assignments that might be appropriate; little of literature focuses on developing communication skills. However, Table 1 shows other disciplines where writing is addressed as a means to affect the pedagogy. The references in Tables 1 are specific examples, by discipline, of the use interleaved writing assignments. Each cited paper makes specific suggestions on writing assignments to enhance communication skills and learning.

Program	Studies
Information Systems/ Computer Science	(Paik and Norris 1983; Flaningam and Warriner 1987; Summers 1990; Simkin 1991-1992; Shibli 1992; Longenecker and Daigle 1996; Zobel 1997; Baker 2003; Pomykalski 2003; Merhout 2004; Merhout and Etter 2005)
Business Writing	(Ault and Michlitsch 1994; Flanegin and Rudd 2000)
Accounting	(DeLeo and LeTorneau 1994; English and al. 1999; Ashbaugh, Johnstone et al. 2002; Rothenburg 2002)
Finance	(Newman and Wachowicz 1989; Singer and Holman 1990; Hall and Tiggeman 1995; Flanegin and Rudd 2000)
Economics	(Crowe and Youga 1986; Cohen and Spencer 1993; Hansen 1993; Palmimi 1996; Simpson and Carroll 1999; Wight 1999)
Statistics	(Paik and Norris 1983; Shibli 1992; Webster 2000)
Engineering	(Snell 1990; Grose 2004)

Table 1: Papers Citing Writing Assignments

This is not to say that pedagogy enhancement through writing is not addressed in IS and Computer Science (CS) courses. In fact, Paik and Norris (1983) discuss the use “think writing” journals, which are a cross between classroom notes and a diary. The journals allow the instructor to examine the progress each student is making toward understanding and assimilating the course materials. Baker (2003) discussed a similar type of writing assignment, known as “the learning log,” which is used specifically in an IS security class. The learning log documents student learning on an individually-directed research topic related to

the course. The log is collected on a periodic basis and graded for progress. At the end of the semester each student is to prepare a presentation based on the results covered in the learning log.

However, most of the literature in IS and CS regarding writing assignments deal solely with suggested writing assignments without any indication of how the assignment ties to learning objectives of the course. For example, Summers (1990) suggests a range of assignments including memos and short communications as well as journals and formal papers. Additionally, Summers emphasizes written documentation as an important form of communication for IS professionals; this point is also made by Zobel (1997). Shibli (1992) discusses the use of documentation as writing assignments and suggests that this helps students interpret and analyze problem solutions. He also uses writing assignments to have students explain their problem solving process in programming courses. Longenecker and Daigle (1996) use journals, essay examinations, and short communications as examples of specific writing assignments. These short communications include lab reports, meeting plans, and meeting logs. Pomykalski (2003) has proposed “non-technology reports” (NTR) as a means to address and expand upon managerial issues. Merhout (2004) and Merhout and Etter (2005) suggest using research papers, journals, exams, and micro-themed papers as means to incorporating writing assignments within a curriculum.

Just adding writing assignments to a course does not ensure that the students are going to become better critical thinkers or learn more. For writing to be truly effective, it must be planned for and designed into the course; tied to specific learning objectives (Emig 1977). If the writing assignments are designed properly they can:

- Improve understanding and retention,
- Make learning active,
- Focus students’ attention,
- Facilitate further thinking about the subject matter,
- Allow for sharing of knowledge between students,
- Provide more immediate and focused feedback.
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In short, writing assignments develop critical thinking skills and help instructors meet their learning goals (Emig 1977; McKeachie 1986; Zinsser 1988; Anson, Schwiebert et al. 1993; Bean 1996; Walvoord and Anderson 1998; Coffin 2003).

This paper addresses this specific issue. In the next section, each suggested writing assignment is “integrated” in that each assignment meets at least two course learning objectives (learning units in the model curriculum).

3. MAKING WRITING ASSIGNMENTS SUCCESSFUL

In this section, specific writing assignments tied to the stated learning objectives in the IS 2002 Model Curriculum are provided. Integrated writing assignments are suggested for the IS major/minor courses only, therefore the IS 2002.P0: Personal Productivity with IS Technology and IS 2002.1:

Fundamentals of Information systems courses are not addressed (Gorgone, Davis et al. 2003).

Each course within the IS 2002 Model Curriculum includes a list of learning units (objectives). While these learning units were constructed for each particular course, Daigle, Landry, et al. (2004) suggest a regrouping the 150 LUs into six content areas: hardware and software, modern programming language, data management, networking and telecommunications, analysis and design, and role of IS in organizations. The largest concentration of LUs come from the role of IS in organizations (51 LUs) and analysis and design (45 LUs) content areas.

Eight of the nine courses have LUs coming from more than one content area; having LUs from different content areas indicates the breadth of each course and allows writing assignments to be integrated across content areas.

This section provides three to five different writing assignments for each of the nine courses. Some of the proposed writing assignments are based on case studies, which have been suggested as an effective means for learning about IS (Szpiro and Neufield 2000; Hackney, McMaster et al. 2003), in addition, learning is enhanced through using writing assignments with case studies (Singer and Holman 1990; Palmieri 1996; Pomykalski 2004).

The proposed writing assignments serve as potential ideas and are not meant to be an exhaustive list of the possible writing assignments; especially given the breadth and depth of the content areas covered in the model curriculum.

3.1 IS 2002.2—Electronic Business Strategy, Architecture and Design

The use of networked information technologies and the “rich variety of business models” (Gorgone, Davis et al. 2003, p. 24) that are spawned is the focus of this course. The framework necessary to understand e-business strategy and the development of e-business solutions is addressed and the learning units (9 in all) are categorized as addressing the role of IS in organizations (Daigle, Landry et al. 2004) category. As such, writing assignments are geared toward linking organizational strategy with the appropriate use of networked IS and technologies; students compare their knowledge of traditional business models to this new paradigm.

3.1.1. Learning Units for IS 2002.2: The learning units that are addressed in the writing assignments below are:

- LU #200—to present organizational value and supply chain concepts, and distinguishing characteristics of traditional versus evolving organizations utilizing internet technologies.
- LU #201—to present and distinguish between types of e-commerce business relationship types including B2B, B2C, B2G, C2C, C2G, G2G.
- LU #202—to present and explain value and supply chain concepts and examples with respect to evolving e-commerce business relationships.
- LU #203—to present consumer issues that are frequently solved in e-commerce systems ... relationships to

information technology development and support.

- LU #205—to present and explain ethical, contractual, and regulatory issues involving domestic and trans-border interactions involving inter-organizational business relationships.
- LU #206—to present, discuss, and explain hardware and software system components commonly utilized in implementation of inter-organizational systems.
- LU #208—to explain and consider the obligations for protection of individual privacy as well as organizational security in inter-organizational systems.

3.1.2. Writing Assignments for IS 2002.2:

WA1. Each type of e-commerce business relationship (LU #201) involves different perspectives with respect to value and supply chain concepts (LU #200). A short compare and contrast writing assignment could be utilized that demonstrates the students' understanding of the examples (LU #202) and how various components of the value and supply chain are featured.

WA2. E-commerce system deployments add a new (integrative) dimension to traditional and inter-organizational IS (LU #206). These systems are typically designed for a broader audience and must work on a number of different platforms (LU #203). Asking students to investigate the failures behind many e-commerce systems will highlight these broader issues. Writing assignments that have students' research and synthesize these issues (abandonment of shopping carts or content presentation) assist them in understanding the human element involved in e-commerce systems (LU #200).

WA3. Successful e-commerce systems rely heavily on concepts taught in marketing and other business fields (Kalakota and Robinson 2001). This assignment underscores the interrelationships between IS and other business fields; specifically marketing (LU #200 and #205). A case study (Fong 2003)—using written deliverables—shows how regulatory issues and user interface issues (LU #203) hamper e-commerce system development.

WA4. Individual privacy issues are the subject of ongoing debates in many organizations as well as in the US and International legislative bodies (LU #208). The issues regarding security vs. privacy can be the focal point of a writing assignment on the balance of privacy versus security from an organizational perspective. Students can examine the ways companies (or even governments) deal with this issue (e.g., in the US, the examination of the HIPAA or USA Patriot Act.), how companies set and maintain electronic mail policies, or how policies on appropriate use and monitoring of Internet capabilities (LU #203 and #206) are developed. Note: HIPAA, which stands for the Health Insurance Portability and Accountability Act, created, for the first time, national standards—in the United States—to protect individuals' medical records and other personal health information (<http://www.hhs.gov/ocr/hipaa/>). The USA Patriot Act was passed soon after the events of September 11, 2001 to improve the counter terrorism efforts of the United States government (<http://www.lifeandliberty.gov/highlights.htm>).

3.2 IS 2002.3—Information Systems Theory and Practice

This course focuses on what makes these individual and organizational decision-making systems successful and the issues that can lead to system failure. Writing assignments are geared to understanding the relationship between organizational usages and IS development; i.e., what is called Task-Technology Fit (TTF) (Goodhue and Thompson 1995); with the learning units coming from the role of IS in organizations and analysis and design (LU #19 and #24) categories.

3.2.1 Learning Units for IS 2002.3: The learning units that are addressed in the writing assignments below are:

- LU #17—to show how IS are a strategic and integral component of an organization.
- LU #19—to present and discuss the relevance of the cognitive process and human interactions in IS design and implementation.
- LU #21—to discuss the Simon Model (Simon, 1960) of organizational decision making and its support by Information Systems.
- LU #24—to explain physical systems and work flow and how IS relate to organizational systems.
- LU #26—to discuss the relationship of IS planning to organizational planning.
- LU #27—to demonstrate specific classes of application systems including transaction processing systems (TPS) and decision support systems (DSS).
- LU #31—to introduce the societal implications of IS and related ethical issues; ... to consider the nature and existence of power.
- LU #119—to discuss and explain ethical and legal principles and issues; to discuss and explain ... distribution, operation, and maintenance.

3.2.2 Writing Assignments for IS 2002.3

WA1. Most strategic IS are developed to gain some competitive advantage (LU #17). Understanding the motivation for a strategic IS development project is important to comprehending its role of IS within the organization (LU #119). Research into the use of various strategic IS, such as Enterprise Resource Planning, Data Warehouses, Expert Systems, etc., allow the student to not only gain a better understanding of the particular technology but also the circumstances that led to the development of the technology (LU #19). A non-technology report (NTR) assignment (Pomykalski 2003) is appropriate in examining the context and subsequent of a strategic IS.

WA2. The linkage between decision-making and IS—namely DSS—can be developed using the Simon model (LU #21) and the framework for DSS usage (LU #27) proposed by Power (2001). Students can associate the best DSS types needed to support decisions made at particular stages of the Simon model (LU #19).

WA3. Pearlson and Saunders (2004) define the relationship between business strategy, organizational strategy and the IS strategy as an equilateral triangle. Given this model, the relationship between IS planning

and organizational planning should be apparent (LU #26). Different case studies (Berinato 2002; Long, Nah et al. 2003; Chae and Poole 2005; Stamati, P. et al. 2005)—with writing assignments—illustrate this relationship and explain how business processes relate to IS (LU #19 and #24).

WA4. Both students and employers alike agree that business ethics is an important academic skill for any educated IS professional (Turner and Lowry 1999; Liebowitz 2004). The placement of these topics (LU #31 and #119) within this course shows the relationship between organizational issues and IS development. Students can research and report on the policies and procedures used in many organizations dealing with information ethics and use the ACM Code of Ethics and Professional Conduct as a guideline (Association of Computing Machinery 1997).

WA5. Systems analysis and design is covered in this course through two specific learning units (LU #19 and #24). Automating workflow process in an organization is often complicated by the fact that many people involved in the process may resist the change. A focused writing assignment on the understanding the underlying business process and the ensuing changes illustrate these issues. This can be accomplished by examining case studies (Gebauer and Schad 1999; Caine, Lauer et al. 2003; Lang 2004) that specifically address workflow automation.

3.3 IS 2002.4—Information Technology Hardware and System Software

This is the most focused course in the IS02MC; all nine LUs come from the hardware and software category. The course specifically addresses hardware/software principles and applications and provides the background necessary to enable IS personnel to participate in systems development projects. Students learn that trade-offs between computer architecture and business performance are often critical.

All IS professionals are faced with the need to communicate effectively the reasons and rationale for many design decision trade-offs; as such writing assignments in this course are critical. The communication of technical concepts and alternative solutions to non-technical personnel is commonplace.

3.3.1 Learning Units for IS 2002.4: The learning units that are addressed in the writing assignments below are:

- LU #62—to explain in systems terms the fundamental characteristics and components of computer ... demonstrate how these components interact.
- LU #63—to provide an overview of peripheral devices and their function.
- LU #64—to introduce the concepts of computer hardware architectures.
- LU #65—to introduce the concepts of software components and interactions.
- LU #67—to introduce the major concepts in operating systems ... and file systems.

- LU #68—to introduce a variety of operating environments (traditional, GUI, multimedia) and resource requirements.
- LU #69—to discuss, explain, and install multimedia facilities.
- LU #70—to introduce the requirements for interoperability and systems integration.
- LU #71—to install, configure, and operate a multi-user operating system.

3.3.2 Writing Assignments for IS 2002.4

WA1. Given a tightly constructed design scenario, the students first decompose the proposed system into its hardware and software components (LU #62). Then specific questions that address the trade-offs made and the reasons for these trade-offs could be addressed. Many of the “introduction to IS/IT” textbooks (Nickerson 2000; Stair and Reynolds 2001) have case studies to address these issues. The components could include peripheral devices (LU #63), software component interactions (LU #65), and operating systems (LU #67 and 71).

WA2. Being able to understand the limitations of existing system architectures is paramount to making changes that will benefit the organizational user. Explaining—in writing—how a given architecture, in terms of hardware (LU #64), software (LU #65), and interoperability (LU 70), either meets or fails to meet the needs of an organization is an important skill. Given a list of user, system, and resource requirements (LU #68), students explain how the current computer architecture needs to be modified to meet the users’ needs.

WA3. The objective of multimedia computing is to allow the end user the ability to merge sound, animation, and digitized video through the use of a computer system (Stair and Reynolds 2001). The components of multimedia can be varied depending on the needs of the user and industry standards. As a final project, the students’ document the components in multimedia configurations (LU #63, #64, #65) and explain the advantages and disadvantages inherent within the system (LU #69).

3.4 IS 2002.5—Programming, Data, File, and Object Structures

This course covers the basics of algorithm development and programming necessary to develop computer-based solutions to given problems. This technically-oriented course explores the varied concepts such as file and data structures, object-oriented and procedural programming methodologies and implementation and debugging techniques.

The mix of learning units from the analysis and design category, the data management category, and the modern programming language category allow for integrated writing assignments to be formulated that compel students to clarify their problem solving reasoning (Shibli 1992).

3.4.1 Learning Units for IS 2002.5: The learning units that are addressed in the writing assignments below are:

- LU #43—to show and explain the logical and physical structure of data to represent characters, records, files and multimedia objects.

- LU #44—to explain the concepts of classes, abstract data types (ADT), and objects.
- LU #46—to present a systems view of object representations and compare with data flow models.
- LU #47—to develop skills in developing an algorithmic solution to a problem and be able to represent it with appropriate program and data objects.
- LU #55—to present and use index file structures, including key organizations.
- LU #56—to explain a variety of fundamental structures that are building blocks for the development of programs and IS applications.
- LU #60—to continue the development of programming techniques, particularly in the design, testing, and debugging of IS related programs of some complexity.
- LU #61—to develop an awareness of the relative capabilities and limitations of most common programming languages.

3.4.2 Writing Assignments for IS 2002.5

WA1. The development of a major database project entails the use of many different types of fundamental structures and programming skills (LU #43 and #56). Creating database requirements in which the performance standards of the database require the students to incorporate indexes is one means to test their skills (LU #55). An associated writing assignment could be to document the design and testing of a database that meet the stated requirements. In addition, the development and creation of a written test plan could be included.

WA2. Choosing the correct tool to solve problems is the goal of any systems analyst. In order to make that choice in an informed manner the analyst must understand the basic capabilities and limitations of the programming tool in representing data (LU #61). In order to assess the students' knowledge of different languages (LU #43, #44, and #47), a writing assignment comparing and contrasting—based on the logical and physical representation—different programming languages, especially an object-oriented language versus and procedural language, can be constructed. This assignment also enables students to formulate taxonomy of programming languages using data representation as a fundamental component (LU #47).

WA3. The communication of the algorithmic solution to end-users—in a narrative form—is highly desired by employers (Jiang, Klein et al. 2003). Prior to the commitment of the algorithmic solution to a programming language, each student should justify their solution and assess the selection of program and data objects to meet the stated requirements (LU #47). In addition, a clear description of the various classes used, and ADT featured in the design is important to communicate to the users the suggested trade-offs (LU #47). The documentation of the solution at a high level—a systems view—ensures that the end user can see that the system requirements are being fulfilled (LU #46).

3.5 IS 2002.6—Networks and Telecommunications

Gaining in-depth knowledge of networking and telecommunications concepts is critical to the development of Information Systems professionals. This course focuses on the analysis and design of telecommunication systems and networks.

3.5.1. Learning Units for IS 2002.6: The learning units that are addressed in the writing assignments below are:

- LU #33—to develop an awareness of how telecommunication systems are used to ..., and telecommuting.
- LU #34—to explore the issues related to the economics, design, and management of computer networks.
- LU #35—to familiarize the student with the telecommunication standards and with regulatory organizations and their standards.
- LU #36—to discuss and explain underlying principles and issues of distributed versus centralized computer systems.
- LU #39—to provide awareness of the responsibilities inherent in providing telecommunication services, including security, privacy, reliability, and performance.
- LU #124—to discuss issues pertinent to the management and transfer of emerging technologies.

3.5.2 Writing Assignments for IS 2002.6

WA1. Information and communication technologies (ICT) support many activities within an organization (LU #33). As new technologies are introduced, new innovative ways to enhance organizational activities are found (LU #124). As in the assignment given earlier (IS 2002.3 WA1), students' research the use of various telecommunication systems—also referred to as communication-driven decision support systems (Power 2001)—to support tactical and strategic initiatives. The outcome is that students gain a better understanding of the particular technology through the circumstances that led to its application. An NTR assignment (Pomykalski 2003) is appropriate in examining the use of telecommunication systems as strategic IS.

WA2. A major element in the design of networks is a fundamental understanding of the costs and benefits that derive from the application of the technology (LU #34). Given—or even after developing—a design, students should research the cost of the components, both hardware and software, to describe the feasibility—economic (LU #34), operational, technological, and/or organizational (LU #33)—of the new design.

WA3. Understanding the restrictions placed on designers from standards and governmental regulations are important in the development of a feasible design plan (LU #35). Incorporating research into US and International regulations compels a student to consider outside factors early in the design process. The use of (Johnson McManus, Carr et al. 2005) as a case study could be an effective learning experience (LU #124).

WA4. Organizations are highly distributed, however, in many organizations centralized computing systems function as a backbone of the organization. Understanding when to use either centralized or distributed computing is extremely important (LU #36). A case study (Sawyer and Gibbons 2000) focusing on the move from a centralized computing environment to a distributed computing environment allows students to apply the underlying principles and to reflect on the move to a distributed environment (LU #33, #124).

WA5. Network security, information privacy, and systems reliability are as important today—if not more important—as systems performance (LU #39). These issues must be considered in the design of network and many of these issues are also called out in the ACM Code of Ethics (Association of Computing Machinery 1997). Students can describe the impact of the specific sections of ACM code on network design issues (LU #33, #124).

3.6 IS 2002.7—Analysis and Logical Design

This course explores the activities and models used in the systems development life cycle (SDLC) with emphasis on teamwork, communication, and project/task management. The majority of learning units come from the analysis and design category, however a small group of learning units address the role of IS in organizations category, and a single learning unit specifically relates to data management. This rich basis of learning units enable students to relate, integrate, and communicate their work in analysis, modeling, and development efforts to business processes.

3.6.1 Learning Units for IS 2002.7: The learning units that are addressed in the writing assignments below are:

- LU #72—to present necessary concepts to provide the skills necessary to do the analysis, modeling, and definition of IS problems.
- LU #74—to show how to collect and structure information in the development of requirements and specifications.
- LU #76—to develop a functional understanding of rapid prototyping and other similar alternative mechanisms for rapid development of IS.
- LU #77—to show how to assess risks and feasibility.
- LU #78—to show students how to analyze organizational systems to determine how the systems might be improved.
- LU #80—to demonstrate and analyze small group dynamics as related to working with users.
- LU #85—to explain the use of a professional code of ethics to evaluate specific IS actions.

3.6.2 Writing Assignments for IS 2002.7

WA1. Within the SDLC different models are used to develop an IS. Pomykalski (2005) describes the use of multiple writing assignments throughout a Systems Analysis and Design course used to get students to develop and describe these models. This provides greater understanding for the use of the multiple methods for gathering, structuring, and writing requirements (LU #72

and #74).

WA2. Self-assessment of one's own abilities and skills is an important but difficult task; each systems analyst needs to understand their individual strengths and weaknesses over the activities in the SDLC (LU #72). With each deliverable involving an analysis or modeling problem students should write a short reflective assessment memo describing the process and activities that were completed and their own involvement in the development of the final deliverables (LU #77 and #85); this assessment could also be done by all group members and clients/users for means of comparison (LU #80).

WA3. Prototype development methods are used in many different phases of the SDLC (Nickerson 2000; Valacich, George et al. 2004). Faced with the different alternatives for developing IS, students may often become confused as to which alternative best suits the given situation (LU #72 and #76). Assessing the use of various methods through case studies (Klempa 1997; Yen 1997) allow the students to review and evaluate the choices made in the context of an actual development effort.

WA4. Feasibility analysis—to assess operational, technical, organizational, resource, and economic feasibility—is an important exercise for any student (or group) to undertake within a Systems Analysis and Design course (LU #72). Through creating a Baseline Project Plan (Valacich, George et al. 2004) with accompanying memo explaining the various outcomes with regard to the feasibility of the project (LU #77) students begin to understand the context for feasibility analysis. In addition, when done in group, each student is asked to comment on the aspects of the feasibility study that could have ethical considerations (LU #85).

WA5. The monitoring and alignment of organizational systems with the business strategy is an important role for the systems analyst. In this regard, the IS professionals should be able to judge and make recommendations as to improvements within organizational systems (LU #78). These improvements, however, must be balanced against the needs and resources of the organization (LU #72), therefore professional conduct issues such as “give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks” (Association of Computing Machinery 1997) must also be a consideration of the analyst (LU #85). In order to assess these learning units, a NTR (Pomykalski 2003) which have students find articles explaining decisions on why improvements and/or upgrades were made could be developed.

3.7 IS 2002.8—Physical Design and Implementation with DBMS

The physical design and implementation of a database are fundamental activities that all IS professionals engage in during their careers; possibly as a first job. This course focuses on these later phases of the SDLC and the use and development of various data models (ERDs and objects) in database development is highlighted.

Given the even mix of learning units, from the analysis and design category, the data management category, and the role

of IS in organizations categories, many different integrated writing assignments can be formulated so that students understand the context of their physical design and implementation efforts.

It is interesting to note that some learning units in this course are already in the form to be converted directly into a writing assignment.

3.7.1. Learning Units for IS 2002.8: The learning units that are addressed in the writing assignments below are:

- LU #87—to show how to develop agreements describing work to be done, and to commit, rigorously complete and self-evaluate agreed work.
- LU #88—to develop skills in data modeling of databases.
- LU #90—to develop skills in application and structuring of database management systems.
- LU #92—to develop skills in application and physical implementation of database systems, using a programming environment.
- LU #94—to provide an opportunity to develop and use project management, project standards, and a system implementation plan, and to implement a documentation plan.
- LU #96—to provide opportunity to develop functional specifications for an information system, ..., information system application controls.
- LU #98—to show how to develop detailed program specifications, develop programs, set up system test parameters, install, and test the new system.
- LU #99—to show how to develop a physical work-flow plan with a client.
- LU #117—to show how to present a system design, test plan, implementation plan, and evaluation, in written and oral form.

3.7.2 Writing Assignments for IS 2002.8

WA1. Dealing with clients—even if it happens to be the instructor—allows student groups to understand the dynamics of the interactions in finalizing a statement of work (Valacich, George et al. 2004) (LU #87) and a work flow plan (LU #98). Upon agreement with the client on these items, the development activities associated with the SDLC dealing specifically with the design and implementation of a database system (LU #96 and #117) are undertaken. Asking students to submit periodic self-assessments and progress reports related to the items in the statement of work emphasizes the importance of completing agreed tasks in a timely fashion (LU #94).

WA2. In the process of developing an information system, timely and thorough communication of key developments, like the design, test plan, implementation plan, and evaluation are critical to the project's success (LU #117). Students should be able to not only write the programs but also test these programs from a developed set of test parameters (LU #98). Written documentation of the development effort and the testing of the database are important to client group in order to evaluate the final system.

WA3. A major function of a project manager is in the communication of the project status to various stakeholder groups. The submission of regularly scheduled status reports (in the form of a memo with appropriate documentation) should be an integral part of any database project deliverable (LU #94). The status report should include an updated Gantt chart as well as a detailed discussion of the stages of the project already completed and the current and future activities (LU #88 and #90) and any problems encountered in the database development project.

3.8 IS 2002.9—Physical Design and Implementation in Emerging Environments

Since many information system development projects do not include the creation of a new database, IS professionals must extend the skills learned in IS 2002.8. This course generalizes the skills used in database development and introduces the students to choices in programming environments and methods.

While many of the writing assignments generated from IS 2002.8 can be refocused for this course, the descriptions below attempt to construct writing assignments more specifically aligned with the IS 2002.9 course context.

3.8.1 Learning Units for IS 2002.9: The learning units that are addressed in the writing assignments below are:

- LU #100—to develop skills in analysis, design, and development of application software using a programming environment.
- LU #101—to identify differences between a structured, event-driven, and object-oriented ... to the design and development process.
- LU #103—to be able to develop program tests and system tests.
- LU #113—to ensure attitudes necessary for successful team behavior ... concept of commitment and rigorous completion.
- LU #114—to ensure goal setting and alignment of team activities with project obligations.
- LU #115—to describe interactions with higher levels of management in selling project objectives and performing project management tasks.
- LU #116—to describe and explain life cycle concepts, and apply them to the course project.
- LU #118—to discuss and apply the concept of life-long learning.
- LU #120—to present and explain the evolving leadership role of information management in organizations.

3.8.2 Writing Assignments for IS 2002.9

WA1. Experience with different types of programming tools and techniques allows an IS professional to make informed choices as to the solutions available for current business problems (LU #100). A programmer must chose and document the tool that best fits the task and therefore

the ability to recognize the differences between structured, event-driven and object-oriented design is fundamental (LU #101). Case studies or problem scenarios examining programming judgments assess the student's ability to make informed choices. The students could be asked to provide recommendations and justification for programming environment choices.

WA2. While all IS projects are different, being able to apply past lessons learned to the current project exhibits "lifelong learning" (LU# 118). In particular, students should be able to extract from the interactions with clients and end users the critical issues and tasks that will lead to project success (LU #114 and #115). These interactions are then applied to specific programming method usage and development of a product that will ultimately meet the needs of the users. Students, as part of a final deliverable to the course project, should reflect on client interactions and how those interactions influenced decisions that were made throughout the SDLC (LU #116).

WA3. The software testing skills of students in IS programs have been shown to be insufficient to meet the needs of industry; however, students have a higher degree of confidence in their understanding than is warranted (Scott, Zadirov et al. 2003). Improvement in the understanding of the testing process—which is really a life cycle activity (Myers 1979)—can be gained through ongoing development, throughout the SDLC, of test cases. In addition, students should justify the nature and the adequacy of each of the tests (LU #103 and #114).

WA4. Examining the current role and skills of today's Chief Information Officer (CIO) is an exercise in skill self assessment. Students can examine and collect the skills demonstrated by today's CIO and compare these skills to their own skills (LU #120). This critical skills self assessment shows students the importance of "soft skills" including team building, listening, written, and oral communications, and broad based problem solving (LU #113).

3.9 IS 2002.10—Project Management and Practice

While IS professionals need technical competence many of the skills that they use on a daily basis deals with the behavioral and managerial aspects of their job. Project management is prominently featured in a number of courses in the IS02MC prior to this course (Gorgone, Davis et al. 2003).

This course covers the behavioral and managerial aspects of project development and students are expected to undertake, manage, and successfully complete all aspects of a major group project. Written communication—especially with shareholders—is an important consideration because one of the fundamental tasks undertaken by a project manager is the communication—in written and oral form—of the status of a project. Assuming that written status reports are a regular deliverable throughout this course, these reports could be used to assess many learning units individually (LU #109, #111, #126). The assignments suggested below integrate multiple learning units from the data management, analysis and design and role of IS in organizations categories.

3.9.1 Learning Units for IS 2002.10: The learning units that are addressed in the additional writing assignments below are:

- LU #105—to ensure skills needed to design a project development and implementation plan.
- LU #107—to develop skill in use of project management tools and methods within the context of an IS project.
- LU #108—to select the proper project management tools and demonstrate their use.
- LU #109—to initiate, design, implement, and discuss project close down.
- LU #111—to develop requirements and specifications for multi-user information system based on a database.
- LU #121—to present and explain the evolving leadership role of information management in organizations.
- LU #122—to examine the process for development of IS policies, procedures, and standards in the organization.
- LU #125—to discuss outsourcing and alternate implementations of the IS function.
- LU #126—to discuss management of time and interpersonal relations.

3.9.2 Writing Assignments for IS 2002.10

WA1. Reflecting on the lessons learned during and after a project is a helpful for evaluating critical decisions and their outcomes; this enhances students' ability in future projects (LU #105). Many authors in business and IS courses (Hansen 1993; Longenecker and Daigle 1996; Wight 1999; Baker 2003) suggest the use of writing journals as a means for students to reflect and learn from their in-class activities. Part of the journal writing assessment could measure individual leadership growth through specific situations faced during the project (LU #121).

WA2. In a business setting many IS professionals are faced with choices as to the tools and methods that they can use; not all of these choices are optimal (LU #107 and #108). Demonstration of the use of these tools is usually done through assessing the degree of success for the final project; however, getting students to discuss the selection criteria is more difficult (LU #105). As part of the regular reporting deliverables, students can examine the choices they make and explain the rationale and consequences for the choices.

WA3. Many companies are seeing outsourcing as a cost effective means to develop projects due to constraints on current resources (LU #125). Many companies have policies and standards in place to determine whether or not a project is developed in-house or is to be outsourced and by examining and reporting on publicly available outsourcing policies students gain an understanding of the nature of work that is developed outside a firm (LU #122). This assignment includes an assessment, by the student, of the types of skills necessary to continue to work as an IS professional under the current outsourcing trend.

WA4. Constructing writing assignments is only half the battle, many faculty would complain that "adding more writing [assignments] to my course will bury me in paper grading" (Bean 1996, pg. 10); however, there are many ways to make the workload more manageable. The next section addresses methods used to make grading more manageable, objective, and rewarding for the student.

4. GRADING AND FEEDBACK

Grading is a chore that no instructor wants more of; however in order to improve and assess student learning, grading is necessary. Grading, especially grading of writing assignments, can be made manageable.

One of the first—and most obvious—suggestions to manage grading is to consider using informal, non-graded writing assignments (Bean 1996). One of the 25 suggestions by Bean (1996) is the "minute paper" in which students are asked to summarize the classroom learning at the end of a period. Informal, often in class, writing assignments are good mechanisms to assess the level of learning and understanding of the students. The assignments also provide the instructor insight into the thinking of students or can allow students to ask questions on items that are unclear and may need to be revisited. Faculty can choose to either not grade or minimally grade informal assignments on a scale like excellent/fair/poor or satisfactory/unsatisfactory.

In addressing the issue of handling graded writing assignments, Bean (1996) suggests ten different ways to "coach the writing process and handle the paper load" (p.217). Any form of writing involves a process of initial writing, critical review, rewriting, gaining outside feedback, rewriting, etc.; rarely does one write a complete draft in one sitting. In order to get students to develop the skills of review and rewriting opportunities for feedback on their writing must be present. There are many ways suggested to provide this feedback to students: instructor-feedback, peer review, writing center support, and conferences (Bean 1996).

Peer review of either drafts or finished work is one means that has been found to be successful (Marcoulides and Simkin 1991; Bean 1996; Walvoord and Anderson 1998; Wiggins 1998). Marcoulides and Simkin (1991) found that students were not only fair and consistent in their assessments but that many of them found peer review to be rewarding; Bean (1996) suggests guidelines for peer review sessions.

One of the key aspects of Bean's suggestions is constant communication of the expectations of the students for the given assignment. Designing and writing a clear and succinct assignment prevents problems of students asking for clarification; this is also a good example to the students of the type of writing you expect from them.

One of the most efficient ways an instructor can clarify expectations is through the use of a rubric. Wiggins (1998) defines a rubric as a set of scoring guidelines for evaluating students' work. In short, a rubric spells out criteria by which the particular writing assignment is to be assessed. This rubric should be given to the students as part of the

assignment itself (Bean 1996; Walvoord and Anderson 1998; Wiggins 1998; Simkins 1999), and many of these authors (Bean 1996; Wiggins 1998; Simkins 1999) suggest having students' give their input into the criteria. There are two basic types of scoring rubrics: analytic and holistic (Bean 1996; Elbow 1996; Wiggins 1998; Simkins 1999). The benefits and tradeoffs of each are well documented (Bean 1996; Walvoord and Anderson 1998; Wiggins 1998; Simkins 1999), but the major advantage to the analytic rubric is that it provides more feedback as to the areas that are in need of improvement (Elbow 1996). Simkins (1999) gives ten pointers in creating rubrics for writing assignments and projects.

Improving students' learning through writing assignments takes commitment from both the student and the instructor. However, the feedback and grading process need not burden the instructor with additional work. The methods briefly described above are suggestions as to how to manage the grading and feedback process and make the writing assignment a positive learning experience for the student.

5. CONCLUSIONS AND FUTURE WORK

"Good writing ability, like good manners, is developed through consistent practice over a long period and that the teaching [and assessment] of writing should be done in courses across the curriculum" (Paik and Norris 1983, pg. 107). Information Systems faculty need to guide students in becoming better problem solvers and communicators of ideas. Improved writing—and thinking—skills will, in turn, make them more valuable business professionals (Liebowitz 2004).

The writing assignments suggested for the various areas of the IS 2002 Model Curriculum have been intentionally designed to interleave course learning units. Therefore, these assignments serve dual purposes: (1) to address the content covered in the model curriculum and improve the learning of the specific "vocational subjects" and (2) to improve the "technology transcending" skills of students as well (Weber 2004).

The best way to continue to create writing assignments for various courses within the IS02MC is to teach the courses themselves. The author intends to continue in creating, assessing, and compiling writing assignments that address the learning units within the specific areas of the model curriculum.

In addition, the two IS 2002 Model Curriculum courses not addressed in this paper serve a wider audience of students and serve as pre-requisites to later courses for IS majors and minors. In the future work, the author will focus on these pre-requisite courses—IS2002.P0 and IS2002.1—and develop writing assignments that not only cover the learning units of these courses, but also serve as foundational assignments for the assignments included in this paper. In this way, students can begin to see the connectedness of the IS curriculum and the foundational nature of the pre-requisite courses.

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