The Living Web: Successful Pedagogy and Challenges

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Abstract

The World Wide Web has influenced and changed almost every aspect of our lives. Web 2.0 provides a globally ubiquitous platform for our everyday collaboration, and is commonly seen as critical piece of the growth strategy for our future. Therefore, providing Business Information Technology (BIT) students with a solid understanding of web development and management of Web-based systems (web applications, client and server hardware, operating systems, network software, browsers and scripts) is essential to our continued advancement. However, technical and educational challenges face both faculty and students. This paper demonstrates how a graduate Web Site Design and Development course address these challenges by providing working professionals (students) with an interactive learning environment. Such an environment includes active student participation, in class project presentations, and lab time for web design and programming.

This paper discusses the course structure, objectives, assignments, projects, case studies, reports, and related learning activities. It delves into analysis of these activities, and concludes with potential improvement opportunities and recommendations.

1. INTRODUCTION

The web has become an indispensable tool covering many aspects of our business, education and personal life. The Web "has changed the ways in which we buy products (e-commerce), meet people (on-line dating, social networking), understand the world (portals), acquire our news (online media), voice our opinions (Web Logs - blogs), en- tertain ourselves (everything from music downloads to online casinos), and go to school (on-line learning)" (Pressman, R., Lowe, D., 2009). The web application serves as the delivery vehicle, which presents the raw information in a structured meaningful packaged presentation, and delivers it to a web site. Web applications are combined with client and server hardware, operating systems, network software,

browsers and scripts to create Web-based systems. The breadth and depth of the various web applications used for business and personal transactions illustrates the importance of properly preparing Management and Business Information Technology (BIT) students with an understanding of web development and eventual management of Web-based systems and applications.

The educational challenge consists of the wide scope and breadth of technology topics to be covered with Web-based system design, and the very diverse academic learning experiences, skills and educational background of Business Information Technology (BIT) students in a graduate class. Students must be provided with both a technological foundation for the understanding of web site development including the HTML language, software programming, and the practical business applications and technological advantages achieved by business with the proper utilization and design of web sites. The faculty of a Web Design and Development BIT graduate course is faced with the significant challenges of covering many diverse IT technologies in a manner, which can be found to be interesting and challenging yet not overwhelming to the diverse student backgrounds.

Educators also have a responsibility to prepare students for successful careers in industry. The Information systems industry is placing increased importance on soft-skills and information technology professionals must learn how to keep abreast of the diverse and rapid changes required by the global knowledge society.

The purpose of this paper is to teach business students, who lack technical savvy how to design and develop web sites for E-commerce without the need to delve into complex IT concepts and techniques. This report explains how a course for Web Site Design and Development was created for graduate BIT students to address these challenges. The course provided an introduction to design of web sites, Hyper Text Markup Language (HTML), basic software programming concepts and the Java programming language for web script development. A number of success strategies, opportunities for improvement, and future directions for teaching graduate and undergraduate

Web Site Design and Development are presented.

It was difficult and impossible to perform statistical analysis on a small population of only 10 students. Consequently, it was not feasible to devise a research methodology for this paper. Instead, the researchers focused the findings on the observations of classroom sessions, student interactions, course deliverables, and literature review results. Thus, we opted to manifest the significance of the subject by citing student's research examples, industry case studies, and recommendations.

2. BACKGROUND

There are two major factors contributing to the importance of teaching web technology. One is the overall growth of web applications for business such as e-commerce and the second is the development of the next generation web. The next generation web is referred to as the Web 2.0, the living WEB, the active web US, or the read/write WEB, and provides "a global, ubiquitous platform for computation and collaboration that is reshaping nearly every aspect of human affairs" (Tapscott, D., Williams A., 2008). Forrester Research Inc. defines the new web as: "A set of technologies and applications that enable efficient interaction among people, content, and data in support of collectively fostering new business, technology offerings, and social structures" (Young, G., 2007). This new web, referred to as the WEB 2.0, provides new mass collaboration. The WEB 2.0, changes how companies and societies harness knowledge and use the WEB in innovative ways to create value and competitive advantage. The interactive forces of the internet are "arming customers with tools that can quickly and exponentially spread the word to another would be customer if a product sticks or a company blunders" (McGee, M., 2008). Companies such as EBay, FedEx, Schwab, OnStar™ and Google know that using a web site to connect with customers is a key to success.

Forrester's research into the Business to Consumer (B2C) E-Commerce market segment illustrates the overall growth of on-line retail and reinforces the importance of Web-based applications. The retail and travel piece of B2C E-Commerce exceeded $200 billion as of March 2007, with 60 million US
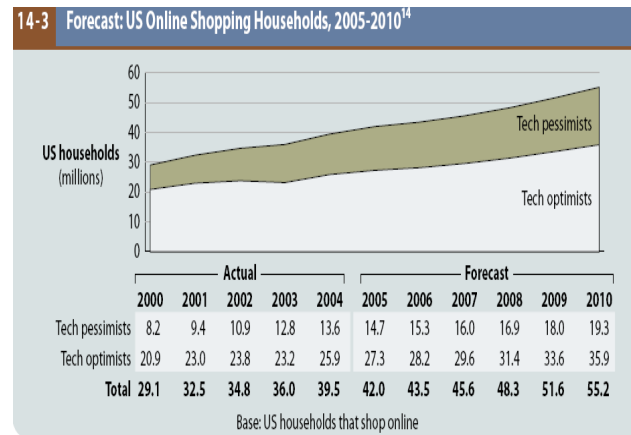
households that shop on-line. The on-line Web-based presence is evolving into a critical piece of the growth strategy for many consumer-facing industries (Malpuru S., 2007). More than 650,000 small, medium and large companies that sell products and services utilize the US online marketplace. The online retail market is continuing to grow at an impressive rate fueled primarily by a steady stream of new online shoppers. "The on-line market is becoming less of a replacement for the brick and mortar retailing and it is a compliment as consumers are integrating the web into their multichannel shopping activities" (Johnson, C., 2005). The 2008 Forrester Outlook for E-Business predicts that the US Online Retail sales will grow to $204 billion in 2008 and continue upward to $334 billion in 2012 as shown in Figure 1. (Johnson, C., 2008).

of US Online Shopping Households from the period of 2005-2010 is shown in Figure 2.

Figure 2: US Online Shopping Household (Schadler, T., Golvin, C., 2005)

Figure 1: US Online Retail Sales (Johnson, C. 2008)

The growth of on-line transactions is supported by increases in broadband access to the Internet, which is expected to reach 71 million households as DSL, Cable and WiMax fight for the market share. "Three and half million more households shopped online in 2004 than in 2003, and we expect a 2.4 million additional household to shop online in 2005 en route to 48% of US households shopping on-line in 2010" (Schadler, T., Golvin C., 2005). The forecast for the number

Given the importance of Web-Based applications for E-Commerce and the major trends of the WEB 2.0 technologies, web competencies are essential for today's BIT graduates. The education and training of future IT and business managers must include:

• An historical overview and review of web technological developments including the history of the Internet.

• The basics of developing and presenting Web-Based applications using the HTML language.

• The basics of programming language structures such as conditional if-then-else, do loops, input, output, processing, and control flow logic.

• The utilization of java scripts and the server-side technologies for the user interaction with web sites and data base storage.

Additionally the presentation of the material must be structured and organized such that the student is actively engaged in the learning environment. All too frequently, teachers utilize lecture methods and instructional techniques that were correct and proper based upon their own educational experiences, with little understanding of students expectations. The challenge of active student participation in the class room was especially important, given that the graduate Web Design and Development course met

for four consecutive hours once a week for ten consecutive weeks. The following evaluation, analysis and future directions are based on the teaching experiences and lessons learned of a newly appointed adjunct professor for a Graduate Web Design and Development Course.

3. COURSE OVERVIEW

According to researcher Trevor Taylor there are differences in opinion on exactly how and what to teach for web development courses (Taylor, T. 2006). Web design and development requires skills and knowledge in a wide range of technologies and it is not possible to cover all relevant topics in a single semester. Web applications consist of both the presentation logic and the business logic, which are considered the client-side running the web browser and must also address the server-side code running on the web server to process the web requests. Although the web development course requires knowledge of many different areas such as databases, programming, graphics, and the traditional skills of analysis, design and project management, the course must present a mixture of topics that is adequate and challenging for the students, but will not be overwhelming to the students (Taylor, T., 2006).

The Web Design and Development course was designed to provide an introduction to the software programming languages used for Web-Based application design and the successful application of Web sites to achieve competitive advantages by business. The course provided the student with an interactive learning environment by having active student participation in class project presentations and lab time for web design and programming. The targeted audience for the course included both working professionals in industry and college graduate students with a diverse age range of twenty to forty year olds.

The overall course objective was to prepare future Information Technology (IT) Managers on the trends and management of WEB hosted business applications. Course objectives were achieved with a mixed mode of lecture material, industry case studies, and student presentation of their assignments. The specific goals and course objectives were to provide the students with funda-

mental understanding of the following topics:

• Ensure that each student has a basic understanding of the information technology tools such as HTML web page development, programming language constructs, java scripts and the ability to successfully apply the tools to complete the course requirements.

• Students will be able to identify the fundamental elements of Web Page Design and Software Development.

• Students will develop a comprehensive understanding of the concepts, terms, industry trends, issues and professional roles in web site creation.

• A comprehensive overview of the processes by which computer programs are developed to solve a business problem or perform a business function will be taught.

• Students will participate in creating interactive web pages in a business environment.

The format of the course was traditional lecture with the professor providing the primary lecture materials and class discussion. The students were provided with computers during the class or utilized their own personal laptops. There was no university provided web site for the course and information distribution consisted of emails and the traditional paper copies of exams and course handouts.

The overall course assignments were structured to achieve the core competencies stressed by the college, which are Communication Skills, Problems Solving Skills, Research Skills, Emotional/Social Intelligence and Mastery of a Business Discipline. The course required students to deliver three project assignments, two exams, a research report and research presentation. The project assignments required the students to develop a non-interactive web site for a dental practice, an interactive web site with java scripts for a bookstore and produce the design specifications for a web site of their choosing. The two exams were open book, multiple-choice questions, and were allowed to be taken during a one-week time period, which accommodated the student's schedule.

The students were given an anonymous student questionnaire to complete and the professor solicited feedback to obtain suggestions for improving the course and teaching future courses. Subsequent to teaching the course, additional research on the teaching web based design courses and literature searches was undertaken to increase the instructor's knowledge and understanding of factors, which could contribute to the success of future course offerings for BIT graduate students. The next sections provide an analysis of the course, opportunities for improvements, and future directions.

3.1 Web Design and Development in Contrast to E-Commerce

Teaching an Electronic Commerce (E-commerce) typically entails covering topics such as sales and marketing, EDI, logistics and procurement, scripting including applets (front-end programs) and servlets (back-end programs), legal, cultural, linguistical issues, transactional processing and e-wallet, etc. On the other hand, a web development and design course focuses on the technical aspects of programming web sites and java scripting techniques.

A software application (including web-based and e-commerce) is typically composed of 4 components or layers:

 1) The presentation layer where the user interacts with the application (this is also know as GUI – Graphical User Interface;

2) The logic layer where the sequence of events within the program get executed to deliver the intent of the application;

3) A data repository of some sort (this is often a relational database management system – RDBMS); and

4) An application programming interface (API) which enables the application to interface with other applications by passing data to and from these applications.

The presentation layer is often categorized as a "front-end" component since it resides on the PC or client, which is on the desktop in front of the user. The other three layers are categorized as back-end layers since they typically reside on the server, which is kept in the data center or computer room (AKA the back room). An e-commerce course focuses on the development of the front-end presentation layer, rather than the back-end layers. A web design and development course focuses on all four layers, but mostly the back-end.

A web application is defined as web-based software that performs business functions using a back end database. Although over half of the business schools in the USA offering Information Systems programs include web development and e-commerce as subjects, only 25% of the 232 schools surveyed teach backend/Server-side Web Development (Taylor, T., 2006). A web application must have both the presentation logic (the user interface) and business logic, i.e. both client side (running in the web browser) and server-side code (running on the web server) (Taylor, T., 2006). Thus, the web design and development course must include the presentation layer by teaching the student the foundations of the HTML programming logic and the development of Java applets for a small application.

4. Success Strategies

Success strategies discussed in this section describe the efforts exerted toward establishing web-based assignments, preparing a research report and presentation, industry case studies and development of a web site project specification.

4.1 Web Based Assignment

The first section of the class provided students with an overview of the history of the internet, the proper formatting of HTML files, and criteria for good web site design. The primary textbook used for HTML formatting was "HTML Your Visual BluePrint for Designing Web Pages with HTML, CSS, XHTML" by Paul Whitehead and James Russell. Additional lecture material about the creation and design of web pages and the history of the internet was referenced from the book "Introduction to Computers" by Peter Norton.

Each lecture session was a mixture of professional PowerPoint presentations, classroom reference material, discussion materials and lab time to experiment with HTML formatting. Each student was asked to develop a web site for a dental office, including hours, services, staff information, emergency contact information, and external links to other dental web sites. The web assignment

required them to include one graphic image or photo on each web page, the web site should contain a minimum of three linked web pages, and it should contain links to other useful web sites for dental patients. The students were only given the option of using the text editors such as notepad to create the HTML file for the dental web site.

The web based assignment provided students with a hands-on learning experience and reinforced lecture materials regarding e-commerce, web languages, and internet usage. The graphical nature of the assignment, the technical challenge of learning web development languages, and the challenge of planning and organizing the format and content of the web pages provided high student motivation. The students were provided with a greater appreciation of course content utility and a skill set, which is directly applicable to the business world.

This course assignment provided a problem centered learning activity, which fosters hands-on activity to produce solutions beneficial to the real life applications, and is a successful and effective learning environment (Laware and Walters, 2004). The web assignment engaged students in an active learning experience, which allowed them to implement methods beneficial to e-commerce business applications and understand the aesthetics of web page format.

Other researchers (Lim, B., et. al, 2003) reinforce the concept of the learning by design approach with the development of web pages for student projects in a graduate level course on learning theory. The development of web pages provides activities, which are highly satisfying to the student, since they develop skills and knowledge effectively and are mentally engaged to a much greater extent by developing the content of the web pages than by studying material. The students are also highly motivated by the web design activity because "they gain a sense of ownership in the product and in their learning and are actively engaged in the creation representation of their own understanding, using their own modes of expression" (Lim, B., et. al, 2003).

4. 2 Research Report and Presentation

Information Technology courses must help the student become knowledge workers, by developing the skill sets necessary to become independent learners who can identify information needs, utilize technology to gather, organize, and analyze information to solve problems (Miertschin & Willis, 2003). Additionally, employers of IT graduates have requested that educators place an increased emphasis on soft skills of speaking, writing and interpersonal communications (Howard, 2005). In addition to high technical knowledge, and the basic IT competency skills of internet usage and search skills, employers also expect the additional value skills or soft skills for the IT professional which include teamwork, communication, oral and personal presentations, project management, leadership and problem-solving. The goal of the research project and class presentation was to provide students with the opportunity to develop the internet usage and library resources search skills and to provide an opportunity to develop presentation and communication skills.

Students had the first half of the ten-week semester to develop both the research report and research presentation, which assisted in their development of time management and project management skills. The syllabus instructed each student regarding the requirements for a research report and class presentation on the successful usage of web technology by a business application. The research report must have consisted of at least three technical references and should range from 1000 to 1500 words. The project presentation should be a PowerPoint slide presentation of approximately ten minutes. Each student was given an opportunity to present their topic and facilitated a question and answer session with the class.

The research report and presentation provided the following learning opportunities to the class:

• Provided for the utilization of the library and internet search engines for technical references to encourage students to maintain and improve their knowledge.

• Gave students exposure to a wide range of diverse topics related to information technology.

• Prepared students for industry by providing an opportunity for developing soft skills of communication and improving their

presentation skills. The student received an email within two days describing the grade for the research presentation, the appropriateness of the topic to the course, and suggestions for improving the student's presentation style.

Students enjoyed the ability to present and discuss the results of their research with the class and the class benefited by the wide range of topics and interesting subjects. One student who was interested in the hobby of fishing did his report on Internet Technology and changes to the fishing industry. The overall report stressed the importance of the internet on both the commercial fishing industry and the pleasure fishing sports industry. Highlights of the report included the facts that in 2001, 34 million Americans went fishing and purchased $17 billion in equipment. The commercial fishing in Alaska during 2007 accounts for 14% of the local economy in SE Alaska, and 18% of the local economy in SW Alaska, with over 93 million pounds of king crab being harvested, with revenue in excess of $400 million.

The overall benefits of the research project and presentation are:

• It provided students with the ability to learn about the application of technology to business contexts.

• Students were given the opportunity to develop their research skills, their communication skills, and their presentation skills.

• Students were allowed wide latitude in selecting their topic, topics were approved and the faculty suggested modifications prior to actually initiating the research activity.

• The combination of a research report and presentation provides students with an opportunity to experience all four learning styles. These styled include reading/writing, visual learning through the development of the graphical presentations of materials, aural learning by listening to other presentations, and kinesthetic learning, which is defined as learning by doing with subject material that was relevant to the course topics and interesting to the student.

Students were more interested and engaged in the research project presentations since the presentation material included class discussions and was more interactive (Howard, 2005).

4.3 Case Studies from Industry

Part of the challenge in teaching this particular class was the class format of four-hour class meetings, which was prohibitive to fill with lecture material. Part of each classroom session included a presentation of case studies from industry related to the course topics. This served to peek the students' interest since they could relate the theory of the course material to the literature and industry case studies. The also found articles relating to business IT trends beneficial to discuss since they could relate it to their professional careers and apply topics discussed in the office environment.

One article which was very applicable to the course was "Close Ties Lessons from FedEx, Schwab, e-Bay and others on the customer driven web economy (McGee, M., 2007) and is shown in Figure 3.

CLOSE TIES
Marianne Kolbasuk McGee
InformationWeek; Nov 26, 2007; 1164; ABI/INFORM Global
pg. 40

Figure 3: CLOSE TIES (McGee, M.. 2007)

The article covered benefits achieved by Charles Schwab hosting on-line forums with customers who gave product development teams insights into the demands of existing clients and more recently an entire generation of prospective clients. Schwab created a web site to allow perspective customers to participate in surveys and discussion groups about their investments, savings and other financial habits. "We learned a lot by asking questions but we learned more by watching them talk to each other" (McGee, M. 2007). Since launching the site, Schwab has opened 60,000 new accounts, increasing the customer base by 40% compared to a year ago.

Another company who successfully applies the next generation WEB 2.0 is OnStar™ to build a panel of about 3,000 OnStar™ customers. Customers participate in surveys about new products and explore the level of interest or potential problems with new features. OnStar™ is very concerned that customers may feel uneasy about how much information OnStar™ monitors and controls about their vehicles, and wanted to evaluate Stolen Vehicle Slowdown, which would allow OnStar™ operators to work with the police to slow down a stolen vehicle. On-line surveys and customer comments convinced OnStar™ to launch the product for Stolen Vehicle Slowdown, which will be released in 2009 (McGee, M. 2008).

FedEx is finding more ways to integrate its offerings with the way people are doing their work and life. "E-Bay sellers for example, can build FedEx shipping labels directly into their E-Bay pages" (McGee M., 2008). It will be possible for customers can ship or track the goods inside the E-Bay application since the FedEX application is integrated with the business software of E-Bay.

A case study about the use on-line web site for banking included the article "Advantage WaMu: The Check Isn't in the Mail" (Hoover, J., 2007) More than two thirds of the WaMu customers use the on-line banking web services provided and a "good number of customers are from places where the bank does not have physical branches" (Hoover, J., 2007). The WaMu.com on-line banking site services over two million customers a day and is on track to exceed one billion a year.

4.4 Web Design Specification Project

The final assignment for the class allowed the students to select a web site they would like to design, and requested generation of the design specifications and statement of work, to emulate the real world business practices of managing outsourced IT activities. The students were given the opportunity to select their own topics for the web site business and the range of business opportunities included:

• A "MentalSpace" web site which serves as your professional private assistant, replacing your PDA and providing both social networking, health habit monitoring, exercise scheduling, journal editor, mediation

templates and other personal goals such as weight loss.

• A software consulting company providing networking, consulting, web development and software support, including the sample web pages for the home page, product and services provided, mission, marketing and sales, support and a contact us page.

• A web page for high school students who require homework tutoring and consulting and also for business professionals who need quick turnaround for presentations and technical research.

• A web site proposal and specification for a local church.

• A web site that was actually implemented by the student for the spouse's flower shop and hosted by a web site provider.

• An employee self-service web site for human relations and employee benefits.

Although the students struggled with the ambiguity of the assignment, the creativity and results achieved were very impressive. The students were most interested in each other's presentation for this final assignment. There was much discussion and group brainstorming that took place to improve each others proposals and suggestions.

5. Analysis

The purpose of performing analysis in this case is to show the degree students are enticed to participate in presenting the application of technology, which they have learned. Furthermore, the outcome of this analysis is largely based on observation of the instructor, instructor evaluations, peer evaluations, quality of the presentation and complexity of the web assignment.

Typically, students avoid participation, and stare at their desk when asked for classroom participation or answers to review questions (Pollard and Duvall, 2006). The techniques, which were successful for this class, were having the students compete for nominal prizes during the presentation of each class assignment. Presenting the class assignments and voting for the best student presentation was adopted from one of the suggested techniques to expand teaching styles provided by Pollard and Duvall (Pollard S. &

Duvall R., 2006). Their suggestion is to include the use of challenging games in the classroom. The challenging game is the opportunity for the student with the best presentation or assignment to win a prize of a bestseller business book such as the "World is Flat", "WIKINOMICS" or a ten dollar Star Bucks gift card. This activity to get the student participating in the class, interacting with each other and commenting on the assignments, added energy, enthusiasm and enhanced learning.

Other benefits of student defined final project approach were based upon the fact that the graduate students were working professional adults. Knowles's theory of adult learning contains the following five principles, which are applicable to student defined project approaches in adult classes:

- Effective adult learning must be by relevancy allowing the student to apply the course material to their work or professional activities.

- Adults are self-directed learners and need to be free to control the learning experience. The student defined final assignment and research project provided students a great deal of freedom in selecting topics.

- Experience is the main foundation for learning activities in adults. The lab sessions and assignments provided during the classroom period provided the students with the opportunity to build and experiment on the lecture material and utilize structured class exercises provided by the textbook authors.

- Adults are practically oriented learners. Allowing students to select research topics and projects directly related to their personal interests reinforces student interest in the course material and provides motivation to the assignments.

- Adult learners are goal-oriented and selection of their own research topics, and final project provides them with additional motivation for mastering course material. (Ellis, H., 2003).

- The education instruments which proved most effective with the student population for the BIT WEB design course were those that provided creativity (web page design and layout), challenges (java

script debugging) and immediate feedback (concurrent peer reviews). Students were more engaged in the material that involved collaboration with each other, presenting and commenting on each other's work rather than traditional lectures.

The web development page and research activity enabled the student to see the results of their efforts and challenged their skills, knowledge and creativity. The web development and java programming activities provided students with the type of learning environment the students excels at, one where the consequences of their actions is immediately displayed. Java programming and HTML web development provide the student with the ability to make decisions and changes interactively and have immediate feedback.

The research assignment and report provided students with a task, which gave immediate public feedback and instructor praise. This appeals to their competitive nature and pride. Hence, the research presentation serves to illustrate to their classmates and instructor how they became well versed in a particular subject matter.

One of the main benefits students gained from this class was the opportunity to work together during the lab time on their individual assignments. Having working professionals with demanding schedules of work, family and school makes it somewhat prohibitive to do group projects. However, each student was able to rely on their classmates during lab time for suggestions and assistance. There was a good group dynamic and team atmosphere for collaboration. With respect to having college students work together on computer programming it has been shown to facilitate each learner's success (Emurian, H., et. al, 2007). Collaborative pair programming is a type of collaborative learning enabling students to teach, coach and/or evaluate each other within groups of two or more students (Emurian, H., et. al, 2007). Another effective learning technique is the usage of sample applets such as the mortgage calculator discussed in Section 6.1.

Avoiding the traditional instructor lecture by having the students give presentations is an approach that students find appealing. Students prefer activities such as debates,

roundtable discussions, and student presentations and they felt that they did learn more from the interactive formats (Sherman, 2005). This is demonstrated in the research presentation, which serves to illustrate to their classmates, and instructor how they became experts in a particular subject matter.

6. OPPORTUNITIES FOR IMPROVEMENT

6.1   Programming Language and JAVA

The students were business managers and working professionals and had no previous computer programming courses. The textbook used for teaching programming constructs was "Simple Program Design A Step by Step Approach" by Lesley Ann Robertson. The textbook included PowerPoint slides for instructor resources and had sample algorithms in the chapter but did no provide sufficient exercises or sample programs to be completed in the lab time.   The "Book of Java Script – A Practical Guide to Interactive Web Pages" by David Thou was found to be superior and includes many good examples of Java programs, which could be utilized in the lab exercises.   One sample program that the students used to understand Java Programming constructs is the sample mortgage calculation shown in Figure 4. The Java programming for Figure 4 is provided in Appendix 1.

Figure 4: Mortgage Calculator Input Screen (Thau, D., 2006

Future offerings of the course will present the programming constructs in a shortened time using lecture material of reference handouts and more sample programming exercises from the JavaScript textbook will be covered in class.   Lecturing about programming constructs was found to be non-value added and student's time and learning experiences were far more productively spent creating, editing, and debugging the sample programs provided in the JavaScript textbook.

The final course assignment for Web site development using Java scripting was to develop a bookstore web site with an input screen of a form to be completed and emailed to the students email address.   The form was to display the date on the top of the web page and then have the customer input the name, address, email address, and search criteria for a book request.   All input fields were to be validated by the java script and the completed request for information data input fields on the form was to be emailed.   The Java script for the solution to this assignment is provided in Appendix 2.

Students had experienced difficulty integrating all the concepts from the class into this final capstone project. This difficulty can be attributed to a lack of previous programming experiences and also the instructor's fault of spending too much time lecturing on the programming constructs theory and not devoting sufficient lab exercise time to java script development and experimentation. Students struggled with the ability to integrate the different aspects of the above project into a cohesive single java script which would both validating the form input fields and then validate the customers' email addresses.

6.2   Testing:

A midterm and final exam, which consisted of fifty multiple-choice questions based upon the lecture material from the textbook, were given and the exams were open book. The students had one full week to complete the exam.   Unfortunately, the exams and grading were done in the traditional mode with paper, pencil and there was no opportunity to improve the grade.   Exam grades achieved for this class when compared to other classes taught were substantially lower.   Classes taught at a different university were able to provide the students with on-line testing and two attempts to take the exam.   The on-line testing was performed with the utilization of Blackboard and is far

superior to traditional paper and pencil modes. The Blackboard™ software provided the students with the feedback of correct answer or incorrect answer, it allowed the student to take the exam twice, and thereby providing the student with the opportunity to improve their grade.   Regarding on-line testing, one student commented: "I really appreciated the style of exams, with the second chance given to complete them. I really felt the instructor wanted the students to succeed."

7. CONCLUSIONS

The paper attempts to present a teaching pedagogy to overcome the challenges and issues faced by faculty for WEB design and development classes for business students. The issues facing the teaching staff of a Web Design and Development course "are many and include:

• Deciding what to teach in a limited amount of time, when there is a wide array of topics;

• The need to teach both "hard" and "soft" skills;

• The very wide range of technologies to be covered;

• Constant changes to the underlying technologies necessitating software upgrades, changes to course materials, and the ongoing training of staff;

• The difficulty of finding suitable textbooks;

• Variability in the skills of the student cohort; and

• The requirements to make the work practical and realistic" (Taylor, T., 2006).

The course assignments and project presented in this paper addressed several of these issues; however, this is still opportunity for continuing improvement. The challenge of teaching JAVA programming languages to students who have no prior programming classes requires the selection of well-researched textbooks, providing the students with more extensive lab exercises to collaborate with each other and provide more opportunity for programming assignments.

The course provided immediate application of the classroom knowledge to industry. The student who developed a commercial web site for the spouse's flower shop illustrates the benefits of the rapid incorporation of academics into industry. Additional benefits include the potential financial impact to the employer, and improved professional stature of the student.   These objectives are achieved by allowing the student to have flexibility in the selection of their web development course project. Students are highly motivated to take Web Design and Development as an elective course, to specifically obtain knowledge that will be directly applicable to their professional activities (Ellis, H., 2003).

In summary the process of teaching Web design and development, to business students who lack proficient programming skills, provides opportunities to develop and improve the student's skills in communication, collaboration, teamwork, and provides a solid foundation to "start them firmly on the road to life-long learning" (Taylor, T., 2006).

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APPENDIX 1. Mortgage Calculator Java Code

```
<html><head><title>Mortgage Calculator</title>
<script language="JavaScript">
<!-- hide me from older browsers

function calculate(interest, principal, years)
{

  if (interest > 1.0) {
    interest = interest / 100.0;
  }
  interest = interest / 12;
  var payments = years * 12;
  var power = 1;
  for (var loop = 0; loop < payments; loop++)
  {
    power = power * (1 + interest);
  }
  window.document.the_form.monthly.value = "$" + (principal * power * interest) /
(power - 1);
}
// show me -->
</script>
</head>
<body>

<form name = "the_form"
   onSubmit="calculate(this.interest.value, this.principal.value, this.years.value);
   return false;">
<h2>Provide this information:</h2>
Number of years: <input type="text" name="years"> <br>
Interest rate: <input type="text" name="interest"> <br>
Principal: <input type="text" name="principal"> <br>
<h2>Click this button:</h2>
<input type="submit" value="Calculate Monthly Payment">
<h2>Your monthly payment is here:</h2>
<input type="text" name="monthly">
</body>
</html>
```

APPENDIX 2. Book Store Request for Information WEB HTML and Java Code

```
<HTML>
<HEAD>
<TITLE> Book Form </TITLE>

<script language="Javascript">
<!-- hide this from older browsers
// get the date information
var today = new Date();
var the_day = today.getDate();
var dayNames = new Array
("Sunday","Monday","Tuesday","Wednesday","Thursday","Friday","Saturday")
;
var the_weekday = dayNames[today.getDay()];
var the_month = today.getMonth();
// correct for the month starting at zero
the_month = the_month +1;
var the_year = today.getYear();
if (the_year < 1000)
  the_year= the_year + 1900
// create the string you want to print
var the_whole_date = " " + the_weekday + ", " + the_month + "/" +
the_day + "/" + the_year;
// show me -->
</script>


<script language="Javascript">
<!-- hide this from older browsers

function checkMandatory()
{
 var error_string = "";

// check for presence of name
 if (window.document.customer_form.name.value == "")
 { error_string += " - Your name is required.\n"; }


// check for presence of zip code
 if (window.document.customer_form.zip.value == "")
 { error_string += " - Your zip code is required.\n"; }


// edit the email address
 var the_at = window.document.customer_form.email.value.indexOf("@");
 var the_dot = window.document.customer_form.email.value.lastIndexOf
(".");
 var a_space = window.document.customer_form.email.value.indexOf(" ");
 if ((the_at != -1) &&  // presence of '@'
     (the_at != 0) &&   // '@' can not be at position 0
     (the_dot != -1) && // presence of '.'
     (the_dot > the_at + 1) &&  // characters between '@' and '.'
     (the_dot < window.document.customer_form.email.value.length - 1) &&
// characters after '.'
     (a_space  == -1))  // no spaces
     { error_string == error_string ; }
  else
     { error_string += " - A valid email address is required.\n"; }


// check the scrollable age group list
```

```
    if (window.document.customer_form.age.selectedIndex < 0)
       { error_string += " - Please select an age group.\n"; }


  // check the book condition radio buttons
   var rad_select = "no";
   for (var loop = 0; loop <
window.document.customer_form.condition.length; loop++)
       { if (window.document.customer_form.condition[loop].checked == t
           { rad_select = "yes"; } }
       if (rad_select == "no")
       { error_string += " - Either new or used must be selected.\n"; }

  // check the book type check boxes
   var chk_select = "no";
   for (var loop = 0; loop <
window.document.customer_form.booktype.length; loop++)
       { if (window.document.customer_form.booktype[loop].checked == tr
           { chk_select = "yes"; } }
       if (chk_select == "no")
       { error_string += " - At least one book type must be selected.\n


  // check for presence of ISBN
   if (window.document.customer_form.isbn.value == "")
   { error_string += " - ISBN is required.\n"; }



   if (error_string == "")
       { return true; }
   else
       { error_string = "Please correct the following errors: \n" +
error_string;
       alert(error_string);
       return false; }
}
// show me -->
</script>


</HEAD>
<BODY>

<H3>

<script language="Javascript">
<!-- hide this
document.write(the_whole_date);
// end hiding comment -->
</script>
</H3>
<H1> <CENTER> <FONT COLOR="Black"> CUSTOMER INQUIRY FORM </FONT>
</CENTER></H1>

<form name = "customer_form" METHOD="Post" ENCTYPE="text/plain"
ACTION="mailto:jeannebungart@hotmail.com"
onSubmit="var the_result = checkMandatory(); return the_result;">

<BR> NAME: <INPUT TYPE="text" NAME="name" SIZE="42" MAXLENGTH="40"
<BR>
```

```
<BR> E-MAIL ADDRESS: <INPUT TYPE="text" NAME="email" SIZE="42"
MAXLENGTH="40" > <BR>
<BR> ZIP: <INPUT TYPE="text" NAME="zip" SIZE="12" MAXLENGTH="10" > <BR>
<BR>

<P> Your age group: </P>

<SELECT NAME="age" SIZE="1">
<OPTION VALUE="teen" > 18-20
<OPTION VALUE="twenties" > 21-29
<OPTION VALUE="mid" > 30-64
<OPTION VALUE="senior" > 65 or older
</SELECT>

<P> TYPE OF BOOK: (Check all that apply) </P>

<INPUT TYPE="checkbox" NAME="booktype" VALUE="textbook" > TEXTBOOK <BR>
<BR> <INPUT TYPE="checkbox" NAME="booktype" VALUE="bestseller" > BEST
SELLER <BR>
<BR> <INPUT TYPE="checkbox" NAME="booktype" VALUE="childrens" >
CHILDRENS <BR>
<BR>

<INPUT TYPE="radio" NAME="condition" VALUE="new" > NEW
<INPUT TYPE="radio" NAME="condition" VALUE="used" > or USED <BR>

<BR> ISBN# <INPUT TYPE="text" NAME="isbn" SIZE="42" MAXLENGTH="40" >
<BR>

<P> <CENTER> <INPUT TYPE="submit" VALUE="Send">
<INPUT TYPE="reset" VALUE="Clear Form"> </CENTER> </P>

<p> <h3> <a href="htmllab.html"> HOME PAGE </a> </h3> </p>

</FORM>
</BODY>
</HTML>
```