AC 2009-299: ON EVALUATING AND RATING ONLINE RESOURCES FOR A NUMERICAL METHODS COURSE

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On Evaluating and Rating Online Resources for a Numerical Methods Course in Engineering

Since 2002, with major funding from National Science Foundation, a wide variety of web-based resources have been developed for, and implemented in, an engineering course in Numerical Methods for Engineers at University of South Florida. These resources include textbooks, worksheets in different computational packages such as Maple[1], MathCAD[2], MATHEMATICA[3], or MATLAB[4], PowerPoint presentations, multiple choice tests, anecdotal stories, audiovisual lectures, real-world applications in engineering majors, blogs, experiments, etc. The resources that have been developed are broad in scope and method and as of spring 2008 address the main topics typically addressed in numerical methods course. The resources are available for anyone to use through the web, thus providing other faculty and students with valuable resources to enhance and augment materials that may already be in use at a given institution.

The creators of the online resources offer the following statements regarding their philosophies, which provide an understanding of their motivation and purpose in developing these materials:

- *(We believe in) having open dissemination of educational materials, philosophy, and modes of thought, that will help lead to fundamental changes in the way colleges and universities utilize the Web as a vehicle for education*[5].
- *(We believe in) providing the numerical methods resources that are **pedagogically neutral** but can be modified to suit an instructor's needs.*

To the extent that techniques and tools are needed to enhance learning using the web include effective and adaptive navigation as well as addressing multiple and diverse needs and interests of the student[6], the development of materials such as these web-based modules are timely and efficient. It is anticipated that as technology becomes increasingly sophisticated and students become more technologically savvy, consistent monitoring will need to be ongoing.

As the use of technology continues to evolve in delivery of instruction, both in depth and scope, the effectiveness of the various tools and approaches used needs to be carefully examined, both from the perspective of students as well as faculty. Thus, the assessment methods and instruments developed and employed in this study provide the community with tools and techniques for doing so. Many of the tools and methods used in this ongoing study were, at least in part, guided by means and methods found to be effective, both conceptually and practically by other experts exploring the delivery of online education. For example, Sonwalker[7] proposes a *learning cube* to consider when developing online instruction. His model incorporates six types of media: text, graphics, audio, video, animation, and simulation with five learning styles: apprenticeship, incidental, inductive, deductive, and discovery. In addition, he recommends four main design parameters that need to be considered: Learning Objectives, Pedagogical Learning Styles (e.g., apprenticeship), Synchronous vs. Asynchronous course delivery, and Textbook vs. Virtual Experiment-Based guided instruction. It is important to keep in mind that for any of these various elements and considerations, many of these categories will overlap or influence one another. For example, defining an individual's learning style is a highly complex endeavor and many people, whether using Sonwalker's categories or other families of learning styles[8], will possess attributes of more than one learning style. However, even with these cautions in mind the utilization of a well-thought out model which clearly delineates conceptual and practical issues to consider is highly valuable when one is embarking on the design and implementation of an online course.

The purpose of this study was not only to gather data from faculty and students regarding their perceived usefulness of these materials in a Numerical Methods course, but also to provide methods and examples of instruments used to evaluate and assess the utility of the tools and information provided through the web-based resources and modules. Although the literature base for evaluating online courses is expanding as a reflection of the ongoing expansion of the implementation of online instruction, much of information available addresses a specific issue, design characteristics, or target population. Currently the prevalence of studies which provide an overall framework with multiple methods and suggestions for assessment of the course is somewhat limited. The following are a few of the limitations or issues one might come across when examining the literature for examining online delivery of courses:

- Many studies focus on a very specific element of online courses that has been shown to be a potential area of concern. One ongoing concern with distance learning is the potential for participant isolation, so some studies focus specifically on social interactions and online participation[9].
- Often, data gathered to evaluate a course is just your standard student satisfaction data[10]. While this may be sufficient for established courses, especially in traditional face-to-face courses, the complexity and ever-changing nature of technology seems to warrant more in-depth investigation, especially of the technologically-related tools and methods employed.
- The delivery of an online course is often a *phased in* process, thus the availability of a large or continuous sample may be of concern. A limitation typically found with many studies involving evaluation of online courses is gathering data from just one group of students/participants[11]. When considering just one (or a very small number) group of students/participants, one cannot allow for possible differences in that group as compared to other groups either in the past or future.

The findings of this study will not only serve to inform the project leadership regarding the effectiveness of the modules, but will also provide the greater community with a breadth of valuable tools and information to both guide online instruction in other courses and at other institutions as well as the evaluation of these courses.

Description of Modules

The web-based modules[12] used in support of the class are customized and holistic in design. The modules provide an overview of essential background needed for the course and present course materials and information using a variety of tools and delivery methods. Students can access information for the course through online textbooks, PowerPoint presentations, videos of course lectures, simulations, and assessments. Material is presented in a manner that illustrates real-life applications and illustrations of the use of course material. Furthermore, special topics as well as information regarding the background and history of the material are presented.

In addition to the holistic nature of the web-based resources, the modules provide faculty and student customization based on engineering major (e.g. Chemical, Civil, Computer, General, Electrical, Industrial, and Mechanical) as well as computational system such as Maple, MathCAD, MATHEMATICA, or MATLAB.

Method

To determine, improve, and refine the quality of the web-based resources, three tools are being used to gather feedback from both students and other faculty who have expertise in numerical methods. This approach provides a means for a thorough review of material prior to implementation as well as ongoing formative evaluation to ensure continual improvements and enhancements. As technology sophistication and availability continue to increase, the need to continually review, assess, and adjust is vital to ensure a high-quality learning environment for students.

Evaluation by External Reviewers

The first of these assessment approaches is a review of four of the modules by faculty members who are experts in the numerical methods. The reviews were conducted by four experts unaffiliated with the primary institutions, thus ensuring an objective and unbiased review. The modules reviewed were those addressing Integration, Ordinary Differential Equations (ODE), Simultaneous Linear Equations (SLE), and Regression. For each module that was reviewed, feedback was gathered through the use of a questionnaire designed to obtain information regarding the perceived utility of the modules (see Appendix A). This feedback was used to make refinements to the modules, both in content and delivery approach. In addition to demographic questions regarding the reviewer (e.g., Academic Rank, Years Experience, and Programming Languages Used), five selected response items specifically addressed the helpfulness of the web-based modules regarding various areas of instruction, including supplementing reading assignments, class presentations, and problem assignments. A seven-point scale was used for these items ranging from Truly Inadequate (value = 1) to Truly Outstanding (value = 7). In addition, five open-ended items asked for specific feedback on the textbook, PowerPoint presentations, multiple choice tests, and e-books. A final open-ended question request general comments if the reviewer was so inclined. Reviewers addressed both technological aspects of the module as well as the content, including layout, formatting, presentation of problems, and organization of materials.

The four faculty members represented varying degrees of experience, from 2 years to 36 years, and all had taught a Numerical Methods course within the last two years. They represented various disciplines of engineering including Electrical, Mechanical, Environmental and Civil. Each reviewer used a different text in their course, with one individual indicating that he used his own notes. In addition, there was notable variation in the software they used in their course, with MATLAB being noted the most often (three times), followed by C++ and Excel (two times each). In general, reviewers appeared to have a positive perception of the materials. Table 1 contains the frequency and percent that reviewers rated each item by module. Mean scores on all items were high, with the lowest mean of 5.0 (out of a high of 7.0) occurring when reviewers were asked to rate the degree to which they believed the web-based modules help develop student's higher order thinking skills and problem solving in Integration and Ordinary Differential Equations. Typically, the highest mean ratings occurred regarding perceptions of the degree of helpfulness the modules provided in supplementing student readings and with class presentations.

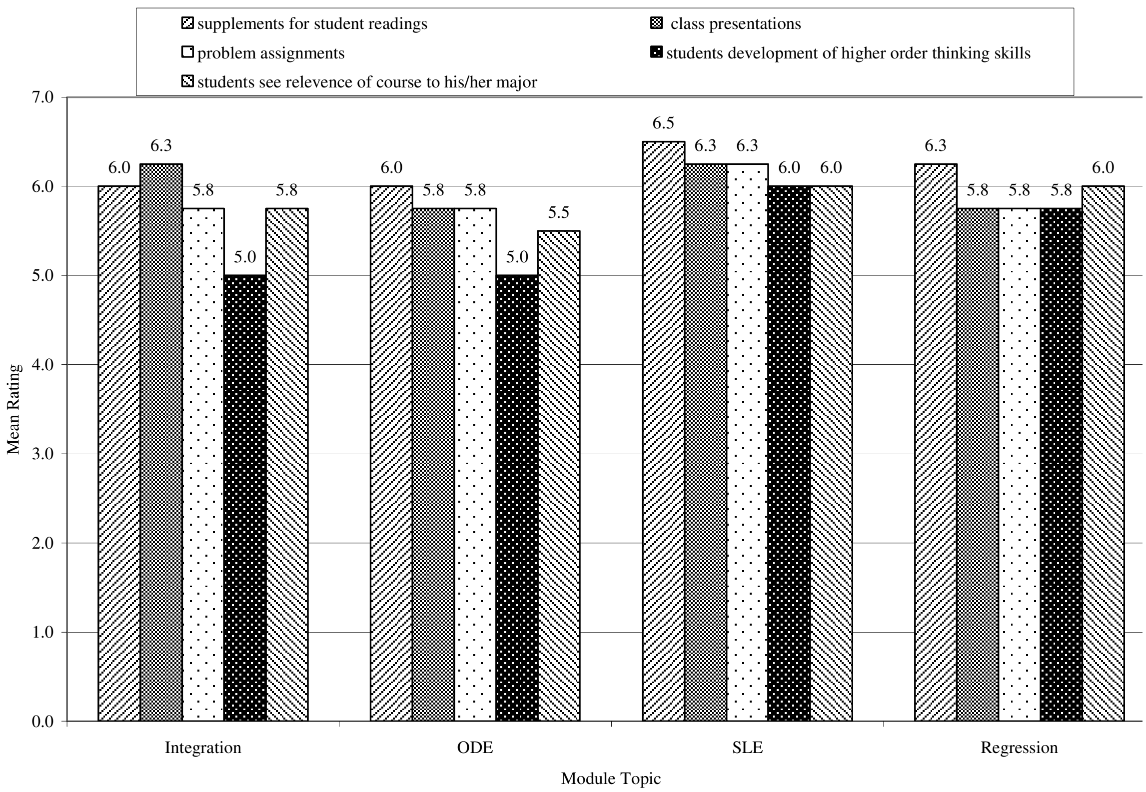

Figure 1. The degree to which module reviewers' believed the web-based modules to be helpful in various elements of the course and student performance

Responses to the five open-ended items were extensive and provide high-quality feedback regarding the website to help enhance the website, both in content and presentation. Reviewers noted both strengths of the website as well as areas that they perceived as needing improvements. All four reviewers provided feedback on each web-based module separately, thus their comments were tailored to a specific topic and area of interest. Responses varied widely in their specificity, from statements very general regarding the web-base modules such as 'It has html, doc and pdf three different formats' (noted as a strength) to those addressing a specific element or subject in a broad manner, such as the case in which one reviewer noted that 'the EBook material appears to be incomplete and poorly formatted', to comments that were highly specific, such as suggesting a different equation representation of a concept.

Web-based Resources Ratings

The second method of assessment was a student survey that gathers feedback from students after each administration of the course. The survey[7] consists of 18 items that address four major domains: 1) Content Factors, 2) Learning Factors, 3) Usability Factors, and 4) Technological Factors (see Appendix B). A four-point scale is utilized on the survey, ranging from 'Poor' (value = 1) to 'Excellent' (value = 4) and was administered to students over eight semesters of delivery of the course, from the spring of 2004 to the summer of 2008. Classes ranged in size from 19 (Spring 2004) to 60 (Summer 2007).

The first domain, Content Factors, was addressed by six items that focused on the perceived quality, accuracy, and relativity of the content presented on the website. The four items addressing the domain Learning Factors gathered information regarding respondents' perceptions of how well the information presented on the website, as well as how it was presented helped them learn the content. The five questions addressing the third domain, Usability Factors, sought feedback about how easy it was to use the website, including issues such as navigation and clarity. The final domain, Technological Factors, was addressed by three items, inquiring about the user's perceptions of the ease with which they could access information, including download time for web pages and browser compatibility.

Table 1 presents the mean rating for each item by semester of the course. The items are grouped by domain and the overall mean for each domain by semester is also presented. Figure 2 provides an overall mean for each item across semesters. Typically, items in the Content domain were rated highest with items in the Usability domain tending to have the smallest mean. However, the mean scores for each item often approximated a rating of 3.0 ('good') or higher.

Although variability across the eight semesters for which data was gathered was limited and, at times, inconsistent among domains, the overall the mean scores on the four domains were relatively strong, ranging from a low of 2.44 on Learning Factors in the second semester of implementation to a high of 3.58 on Technological Factors in the first semester of implementation (see Table 1 and Figure 3). Mean scores tended to be strongest across years on items falling within the Technological Factors domain (with the exception of Summer 2008), followed by items in the Content Factors domain. Items falling within the Learning and Usability Factors domains tended to show the lowest means, although they were still relatively strong. With the exception of a decrease in the second semester of using these modules, there has been an overall positive trend which has become relatively consistent over the most recent semesters, with an overall rating 3.06 in the spring of 2008, rising to 3.29 in the summer of 2008 (see Figure 3).

Table 1

Mean item and domain ratings by semester

Item	Spring 2004	Summer 2004	Spring 2005	Summer 2006	Spring 2007	Summer 2007	Spring 2008	Summer 2008
	N = 19	N = 42	N = 37	N = 49	N = 49	N = 60	N = 36	N= 49
Content Domain								
Quality of the Content	3.26	2.76	3.11	3.10	3.14	3.27	3.22	3.59
Accuracy of the Content	3.58	3.21	3.27	3.33	3.33	3.40	3.33	3.69
Validity of the Content	3.26	2.74	3.30	3.27	3.31	3.30	3.39	3.53
Presentation of the Content	3.58	2.74	3.16	3.10	3.08	3.23	3.03	3.33
Quality of the Media	3.11	2.40	3.03	2.88	2.83	2.77	2.91	3.04
Giving Sources/Authors Credit	3.42	2.83	3.22	3.12	3.24	3.25	3.23	3.47
Learning Domain								
Ability to Identify Concepts	3.11	2.50	3.14	2.98	3.02	3.08	3.14	3.41
Learning Style Match	2.79	2.10	2.86	2.71	2.73	2.72	2.58	3.02
Media Enhancements	3.00	2.29	3.11	2.67	2.74	2.67	2.58	3.06
Multiple Choice Exams	3.12	2.86	3.08	3.02	3.06	2.79	3.08	3.29
Usability Domain								
Graphical User Interface	3.05	2.60	3.06	2.69	2.96	2.82	2.94	3.02
Interactive Design of the Website	3.05	2.69	2.92	2.88	2.92	2.82	2.81	2.94
Clarity of the Website	3.32	2.74	3.00	3.02	3.08	3.25	2.86	3.27
Appropriateness of Page Length	3.11	2.57	3.03	3.08	3.15	3.02	3.00	3.24
Page Layout and Ease of Access	2.95	2.79	3.00	2.90	3.02	3.22	2.78	3.20
Technological Domain								
Time to Download WebPages	3.26	2.67	3.30	3.35	3.27	3.46	3.44	3.24
Ability to Access WebPages	3.53	3.00	3.41	3.49	3.22	3.42	3.28	3.31
Compatibility of Browser	3.58	3.12	3.46	3.55	3.41	3.57	3.47	3.55
Content	3.42	2.86	3.11	3.27	3.22	3.27	3.28	3.55
Learning	3.11	2.44	3.13	2.98	3.00	2.97	3.00	3.24
Usability	3.05	2.60	2.97	2.92	2.96	3.10	2.89	3.14
Technological	3.58	2.88	3.37	3.45	3.33	3.55	3.47	3.39

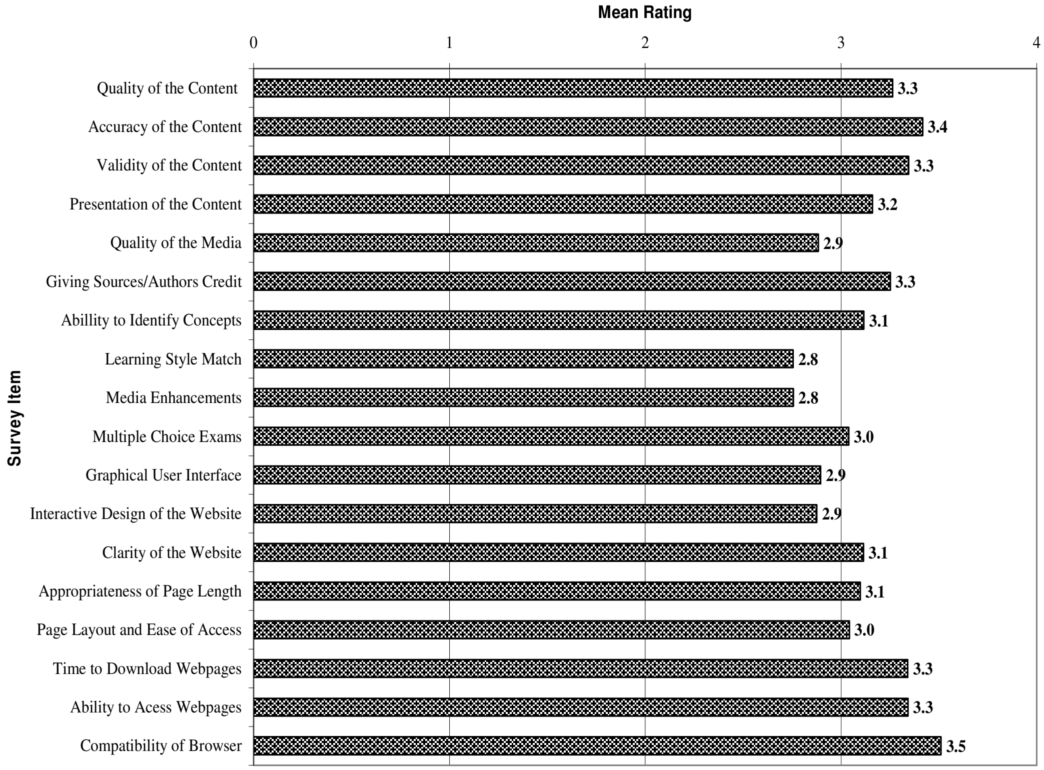

Figure 2. Means scores for each item across all eight semesters

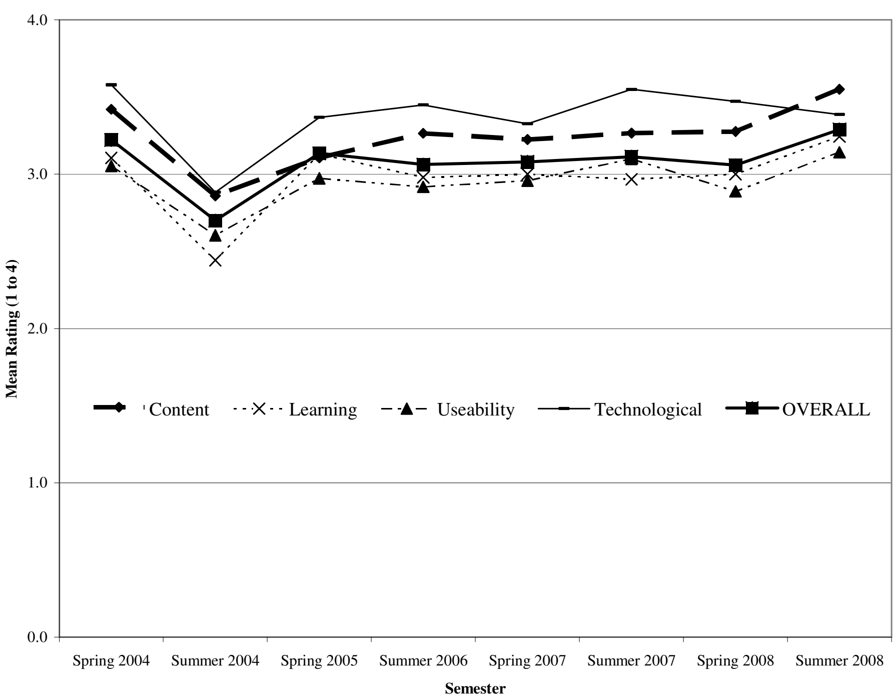

Figure 3. Mean domain and overall ratings, by semester, on the Student Website Satisfaction Survey

In addition to examining the mean scores for the domains and overall ratings, further investigation was conducted using a chi-square analysis (observing a type I error rate of 0.05) for each domain. A Chi-square analysis was considered the most appropriate data as we were examining differences in scores within categories (semesters) which was not a numeric variable. In addition, the mean scores for each student within each domain were rounded to the nearest whole number (1-4) to ensure similar ranges and intervals for each semester. Table 1 provides a summary of these results. Considering a Type I error rate of 0.05, statistically significant differences were noted within three domains, Content (p=0.005), Learning (*p*=0.016) and Technological Factors (*p*=0.009).

Table 2
Summary of the Chi-Square analyses for each of the four survey domains

Domain	N	χ^2	Df	*p*
Content	343	41.1	21	0.005
Learning	343	45.4	21	0.016
Usability	343	31.4	21	0.067
Technological	343	39.3	21	0.009

Due to the notable fluctuations in the first two semesters (spring and summer 2004), the analysis was rerun considering only the most recent six semesters, spring 2005 to summer 2008. The results of this analysis of a subset of the data did not indicate any statistically significant differences (α=0.05) on any of the domains across these six semesters, indicated a relatively stable and positive level of satisfaction with the website over recent course administrations.

In addition to the 18 selected response items, 3 open-ended items are included on the student satisfaction survey that are intended to gain reasons behind student ratings and provide feedback on the strengths of website and modules as well as perceived needs. These three questions are:
1) What did you like most about the website?
2) What did you like least about the website?
3) What would you like changed about the website?
Answers to these items help guide refinements and adjustments to the website after each offering of the course.

With regards to the first question, ‘What did you like most about the website?’, student responses across the semesters tended to be relatively consistent in their focus. The majority of comments tended to fall into three broad categories, (1) having a variety of tools (e.g., videos, multiple choice questions, and links to relevant information), relevance to class material (e.g., ability to review class topic, keep up if a class was missed, and (3) utility (e.g., navigation, ease of use, and layout). As one respondent wrote in the summer of 2008: “Very clean and simple layout yet full of information. The font size, color and background are excellent. I like the website because it is very accurate and it is easy to read. Also helped me to learn the material a lot”.

Responses to the second question, 'What did you like least about the website?' were fewer in number and often indicated that they had no problem with the website. However, a few issues addressed included confusion of busy-ness when trying to use the website (e.g., too many links), a need for more resources (e.g., videos), and difficulty accessing or downloading materials. It is notable that for each semester, the number of substantive responses to the item asking what students liked about the website was notable larger than those who provided feedback about what they like least about the website. For example, in the summer of 2007, there were 61 responses to the first question and only 26 to the second (not including those that wrote 'nothing' or something similar'). Over time, there tended to be a slight shift in some of the types of things that students addressed, including a shift from comments requesting more practice problems to requests for more detailed solutions**.** This was an indication due to revision of the problem sets, but at the same time, there was a lack of complete solutions. This has been addressed in spring 2009 by having complete solutions available to multiple choice tests. Issues such as technological problems (e.g., download time, software compatibility) tended to be addressed by a small number of students each semester and seemed to be more indicative of individual issues, rather than widespread problems.

Finally, responses to the final open-ended question 'What would you like changed about the website?' tended to address issues similar to those found in the responses about what respondents like least about the website, including more videos, easier access, and checking links. Although they tended to decrease over time, there were continued requests for more examples, fuller explanations/solutions to those provided, and more quizzes. Although some respondents indicated issues with layout or navigation, many students tended to like those items. One student noted that he/she found the navigation 'stiff' but recognized that others would probably like it. This response illustrated the need to be aware that preferences regarding issues like layout, organization, and navigation are often based on personal preferences. This was evident in comments provided for each semester, with some students indicating a positive view of the layout and navigation of the site, and others indicating a dislike for these areas. One student in the final semester of the survey responses provided a suggestion to removed unused links. As the complexity of the website increases, due to additional modules, resources, and information, there may be an increased need to simplify navigation (e.g., reduce the number of links required to get to certain areas of the website).

Google Analytics

Third, Google analytics[13] were used to analyze the visits to the website (see Figure 4 for a screenshot of one of the types of reports this tool provides). "Google Analytics shows you how people found your site, how they explored it, and how you can enhance their visitor experience" – Google Analytics Website. The site has been tracked since April 2008, and it has been an eye-opener to see how users use our website. The information analyzed by Google analytics includes the following.

a) *Top content topics*: This gives the web links that are most popular with the users. Web pages that show all the resources for a particular numerical method on one page are the most popular. Since then individual web pages for all the numerical methods have been developed. Users are also made aware of these popular web-pages so that they can see what others are reading.

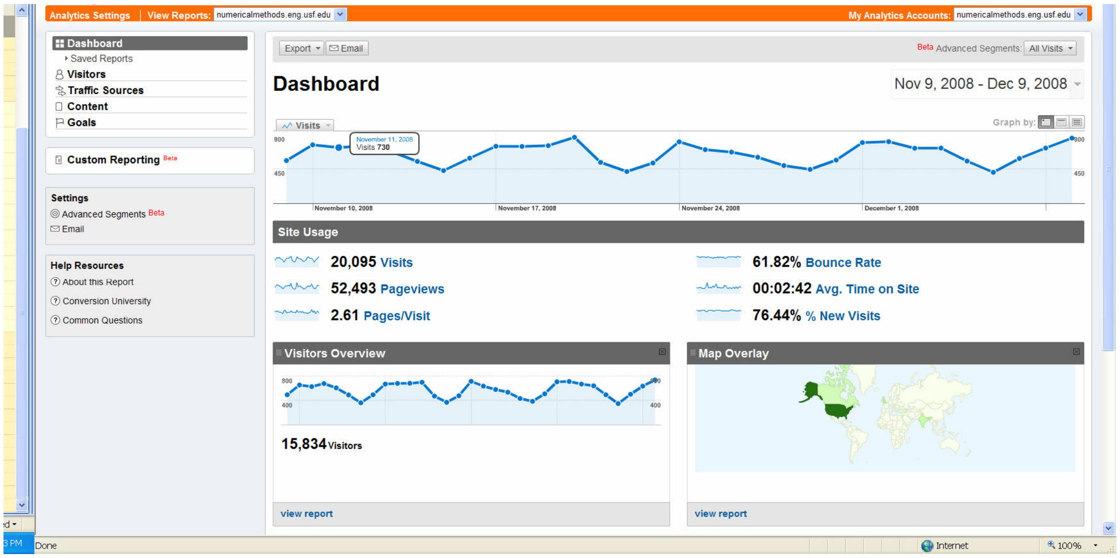

Figure 4. Google Analytics report on site visitors

b) *Referring sites*: This information allows finding the sites that refer to the website. So far, Wikipedia is the largest referring site. But what is most important is to be able to find institutional (.edu) sites and blogs that refer to the website. This gives a fair idea of how learners are using the site information, and how the resources on the website can be improved.

c) *Search words*: This is a set of popular search words used that send users to the website. Again, these search words have been used to develop an alphabetically ordered keyword web page. This allows further directing the users quickly to the relevant information.

d) *Visitor loyalty*: This shows how many users are returning to the site (24%). We do not expect the visitor loyalty to be high as most users are students who are taking a course in numerical methods or are using numerical methods in another course. These loyalties may last a semester or two for most students.

e) *Time on site*: This value gives the average time spent on the site. Since the website is a reference site, the user is expected to get their information and move on. If the average time spent on the site is high, that means that they are spending too much time to get the relevant information.

f) *Traffic sources*: The traffic to the site is reasonably distributed between search engines (57%), referring sites (26%), and direct traffic (17%).

To develop a better gage for the success of the website, we are developing a single metric to measure how well we meet the objective of the site. Google analytics offers to calculate *goal conversions* based on the data it collects. At this time, we are leaning toward using a metric that is based on visitor traffic, page views/visit and direct hits. Details of this metric will be available at the time of the presentation.

Conclusions

The findings of this study provide strong evidence that the use of the website modules can be a valuable tool in classroom as well as online instruction. However, this study goes a step further, providing examples of methods and instruments that may be utilized to help ascertain the effectiveness of various components of, and approaches to, online instruction. In addition to the relatively common approach of using student surveys for feedback, the element of having a thorough exam of modules by other faculty in the area at other institutions adds an extra dimension of thoroughness as the students who take this course come from, and are headed into, widely diverse experiences and fields, using multiple tools. In addition, the use of outside faculty to help inform this project provides an excellent example of how working across institutions can strengthen courses and provide additional tools to professionals through the field.

The instrument used to solicit feedback from students in this study was modifed to specifically address the areas of interest to the professor regarding concerns with the utility of the website and modules. This illustrates the need to ensure that any instrument used to collect data should be carefully reviewed to ensure it addresses specific needs of those gathering the data. As a result, the findings from the survey data provide the professor with information specific to his/her needs. For example, findings of this study and those done previously under this project underscore the need for increasing the availability of information in multiple modes and formats to students in a flexible manner so as to provide them with accessible and convenient learning material that enhances traditional methods. Students were very favorable about the use of the web-based modules and found the easy access to other resources, examples, tools, strategies, and practice assessments as benefiting their ability to learn the material. The ability to review material as often as needed may help lessen the stress in learning difficult concepts.

Finally, the use of Google Analytics to provide further information about how individuals are accessing and using the website provides valuable insight into what areas and topics are most often used or accessed. This provides the instructor with objective data with which to guide potential changes to the website, including topics to be addressed, navigation and design, as well as potential areas or topics that may be minimized or eliminated.

Although the findings of this study served to inform the specific course and instructor regarding website utility, strengths, and weaknesses, it also provides other instructors with tools and techniques for assessing their own online instruction. The use of outside reviewers and Google Analytics are examples of approaches that may not be common in evaluating web-based instruction and resources. However, the inclusion of such unique methods of assessment add important dimensions and information to the evaluation of the online resources available to not only students enrolled in the course, but also to any individual interested in increasing their knowledge of numerical methods. Thus, it is hoped that other instructors and professionals incorporating web-based tools can use the instruments and methods illustrated in this study to help them assess their own online initiatives using multiple and innovative approaches.

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References

1. Maple 12, Advancing mathematics. http://www.maplesoft.com/, accessed January 2009.
2. MATHCAD 13, The industry solution for applying mathematics. <http://www.mathcad.com/ >, accessed January 2009.
3. MATHEMATICA 6, The way the world calculates. http://www.wolfram.com/, accessed January 2009.
4. Matlab 2008a: Increasing the scope and productivity of engineering science. http://www.mathworks.com/, accessed January 2009.
5. MIT Open CourseWare (2009), Available: http://mit.ocw.edu
6. Hasegawa, S., Kashihara, A., & Toyoda, J. (2003). E-learning library with local indexing and adaptive navigation: Support for web-based learning. *Journal of Educational Multimedia and Hypermedia*. 12, 91-111.
7. Sonwalker, N. (2001). The sharp edge of the cube: Pedagogically driven instructional design for online education. http://campustechnology.com/Articles/2001/12/ accessed January 2009.
8. Gardner, Howard (1983). *Frames of Mind: The theory of multiple intelligences*. New York: Basic Books.
9. Guan, J.F., Tregonning, S., & Keenan, L. (2008). Social interaction and participation: Formative evaluation of online CME modules. *Journal of Continuing Education in the Health Professions,* 28(3), 172-179.
10. Settle, A., & Settle, C. (2007). Distance learning and student satisfaction in Java programming courses. *Journal of Universal Computer Science, 139*(9), 1270-1286
11. Bangert, A.W., & Easterby, L (2008). Designing and delivering online nursing courses with evolved electronic classroom. *CIN-Computers Informatics Nursing,* 26(2), 99-105.
12. Kaw, A.K., Collier, N., Keteltas, M., Paul, J., & Besterfield, G. (2003) Holistic but customized resources for a course in numerical methods, *Computer Applications for Engineering Education, 11*, 203-210.
13. Google Analytics (2009). Available http://google.com/analytics

Appendix A
Module Reviewer Assessment Form

Holistic Numerical Methods Institute

Website Evaluation

Thank you for agreeing to evaluate a specific numerical method module available at the website http://numericalmethods.eng.usf.edu. Your feedback will help us improve the current resources as well as revise our course of action for future resources. A consulting fee of --- is offered for your services.

On the home page of the website http://numericalmethods.eng.usf.edu, choose ____ as a mathematical procedure, a mathematical language of your choice, and an engineering major of your choice. Click on the GO button.

Please review the content available at the website including the background notes, textbook notes, simulations, power point presentations, multiple choice questions, e-books, anecdotes, etc. Then answer the following questions.

1. Name ____
2. Rank ____
3. Years of teaching experience: ___________________________
4. Last time you taught the undergraduate Numerical Methods course (year) _____________
5. Home Department ______________________________
6. University Name _______________________________
7. Textbook used __________________________________
8. Programming language(s) or package(s) used _________________
9. The web-based resources allow you to choose an engineering major of your choice. The engineering major of the module you reviewed was from (*select one*)
   A. Chemical
   B. Civil
   C. Computer

D. Electrical
E. General
F. Industrial, and
G. Mechanical.

10. The web-based resources allow you to choose a mathematical package of your choice. The mathematical package of the module you reviewed was (*select one*)
    A. MathCAD
    B. Maple
    C. MATHEMATICA
    D. MATLAB.

11. In terms of the web-based modules being helpful to *supplement* your *students' reading assignments*, you would say they would be (*select one*)
    A. Truly Inadequate
    B. Poor
    C. Adequate
    D. Good
    E. Very Good
    F. Excellent
    G. Truly Outstanding

12. In terms of the web-based modules being helpful to your *class presentation*, you would say they would be (*select one*)
    A. Truly Inadequate
    B. Poor
    C. Adequate
    D. Good
    E. Very Good
    F. Excellent
    G. Truly Outstanding

13. In terms of the web-based modules being helpful to your *problem assignments*, you would say they would be (*select one*)
    A. Truly Inadequate
    B. Poor
    C. Adequate
    D. Good
    E. Very Good
    F. Excellent
    G. Truly Outstanding

14. In terms of the web-based modules being helpful to your *students developing higher-order thinking (e.g. analysis, synthesis and evaluation) and problem solving skills*, you would say they would be
    A. Truly Inadequate
    B. Poor
    C. Adequate
    D. Good
    E. Very Good
    F. Excellent
    G. Truly Outstanding

15. In terms of the web-based modules being helpful to your *students to see the relevance of the course material to his/her major*, you would say they would be (*select one*)
    A. Truly Inadequate
    B. Poor
    C. Adequate
    D. Good
    E. Very Good
    F. Excellent
    G. Truly Outstanding

16. Comment on the textbook notes on the background, physical problem, and numerical method topics (What did you like most, what did you like least and how can they be improved).

17. Comment on the power point presentations (What did you like most, what did you like least and how can they be improved).

18. Comment on the multiple choice tests (What did you like most, what did you like least and how can they be improved).

19. Comment on the e-books (What did you like most, what did you like least and how can they be improved).

Please write any other general comments you may have (optional).

Appendix B
Evaluation of Web-Based Resources

Course Name ________________________
Semester ____________________________

In this **anonymous** survey, we are requesting you to evaluate the http://numericalmethods.eng.usf.edu. Although not a complete resource, this website continues to add web-based resources that help you in understanding your numerical methods course.

Your input will help us improve the web-based resources for factors of
Content: quality, accuracy, validity, presentation, media quality, and source credit;
Learning: identifying concepts, learning style, media enhancements, and assessment tools;
Usability: graphical user interface, interactive design, clarity, appropriateness of length, and page layout; and
Technology: time to download, ability to access, and compatibility of browser.

Please circle the most appropriate choice.

1.The quality of the content was ___________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

2. The accuracy of the content was __________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

3. The validity of the content of the website in relation to the course objectives of nonlinear equations and interpolation was ______________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

4. The presentation of the content was ____________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

5. The quality of media such as simulations, audio and video was _____________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

6. Giving sources and author of content proper credit was ________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

7. Your ability to identify concepts from the web site was ____________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

8. How well the website matched your learning style was _______________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

9. How well the media enhancements such as simulations, videos, etc helped you learn was _________________.

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

10. The multiple choice question exams were ____________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

11. The graphical user interface, such as graphics, type font and navigation bars, was _______________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

12. The interactive design of the web site was ___________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

13. The clarity of the web site was _____________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

14. The appropriateness of the length of the individual pages of the web site was ______________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

15. The page layout and ease of access from other pages of the web site was _____

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

16. The time it took you for downloading web pages was _________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

17. The ability to access the web pages was _________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

18. The compatibility of the browser you used with the website was __________________

a. Excellent
b. Good
c. Average
d. Poor
e. Absent

19. What did you like most about the website?
20. What did you like least about the website?
21. What would you like changed about the website?