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Abstract: A significant amount of freeware is accessible to students and faculty, from a variety of sources, and downloadable from a multitude of web-sites. Much of the freeware, often of equivalent quality to commercial off-the-shelf software, and many times unique and having no commercial equivalent, is underutilized by both educators and students, who generally are unaware of its availability. With constraints on their financial resources, students and faculty are faced with limits on the purchase of commercial software, and would significantly benefit if they were to have a single place they could visit to obtain relevant software which is legitimately free of commercial fees. Our objective for this effort is the design and development of a WebCenter which will provide a "one-stop shopping experience" for both students and faculty who are seeking to obtain relevant freeware for their pedagogical needs. The WebCenter will satisfy the diverse needs of a community of users, who will provide links to the software titles which they use or have developed, and who, using a simple Technology Acceptance Model-like evaluation scheme, will supply collaborative feedback on the freeware titles, share their experiences with them, and provide suggestions for their usage. A preliminary taxonomy of pedagogical freeware has been designed, to categorize the freeware titles, and provide for ready retrieval by the user community.

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Towards a WebCenter for Pedagogical Freeware Collaborative Review and Retrieval

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Abstract

A significant amount of freeware is accessible to students and faculty, from a variety of sources, and downloadable from a multitude of web-sites. Much of the freeware, often of equivalent quality to commercial off-the-shelf software, and many times unique and having no commercial equivalent, is underutilized by both educators and students, who generally are unaware of its availability. With constraints on their financial resources, students and faculty are faced with limits on the purchase of commercial software, and would significantly benefit if they were to have a single place they could visit to obtain relevant software which is legitimately free of commercial fees. Our objective for this effort is the design and development of a WebCenter which will provide a "one-stop shopping experience" for both students and faculty who are seeking to obtain relevant freeware for their pedagogical needs. The WebCenter will satisfy the diverse needs of a community of users, who will provide links to the software titles which they use or have developed, and who, using a simple Technology Acceptance Model-like evaluation scheme, will supply collaborative feedback on the freeware titles, share their experiences with them, and provide suggestions for their usage. A preliminary taxonomy of pedagogical freeware has been designed, to categorize the freeware titles, and provide for ready retrieval by the user community.

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1. FREEWARE: DEFINITIONS, SOURCES AND AUTHOR MOTIVATIONS

Freeware is generally considered to be computer software which is available free of charge and distributed via the World Wide Web. Usually (but not necessarily) freeware is distributed without source code, and is often accompanied by a license and copyright which permit redistribution, but will often have limitations, such as restrictions on commercial use. The term freeware was coined by Andrew Fluegelman in the early 1980's, who applied it to a piece of communications software he developed for the MS-DOS platform, called PC-Talk, and which he distributed to others. Fluegelman marketed PC-Talk using the term "freeware," which he characterized as "an experiment in economics more than altruism." Contrary to the popular usage of the term today, Fluegelman actually encouraged users to make voluntary payments for the software, and though he trademarked the term "freeware" to describe this, other software developers substituted the term "shareware" as a more realistic designation which negated the gratuitous tone of the original term.

In contrast to what we call freeware, shareware is software that is also distributed typically via the World Wide Web, and allows a user to try out the software for a specified period of time, after which the user is obligated to provide a payment to the shareware author(s). The term shareware is due to Bob Wallace (http://tinyurl.com/5mlko) who coined this term to describe his word processor, PC-Write, in the mid-1980's.

A slight variant of shareware is termed "crippleware," and refers to the notion that the full features of the shareware title can only be obtained after the payment of the registration fee – until then, several features will be "crippled."

We do note the confusion which persists today as to the current definition of freeware. It should not be confused with shareware (although the originator of the term "freeware" is generally credited with introducing the shareware concept). Nor should it be confused with open-source/free software, whose license permits its use, modification and redistribution, with or without charge. Freeware does not permit modification of its source code, and usually does not provide source code. The word "free" in freeware refers only to its price, while the "free" in "free software" refers to the freedom to modify the source code.

We also have the software category "public domain software" which is characterized by the absence of a copyright (in contrast to freeware, which is copyrighted), and therefore can be freely distributed without charge. There are also two variations of freeware which are becoming more popular today. One is donationware, which is freeware with an OPTIONAL request to make a small donation, either to the author or some third party, typically a charity or socially aware organization. The other is postcardware, which is freeware with an OPTIONAL request to send the author a postcard, expressing thanks and presumably to serve as a de-facto registration for the software, and perhaps provide the freeware author with some personal satisfaction in seeing the geographic distribution of users of his/her software.

Another emerging popular variation of freeware is adware, which is similar to freeware in its distribution and copyright attributes, but is characterized by requiring the user to view commercial advertisements while using the software. Adware is sometimes bundled with spyware, and while ostensibly there is still zero "cost" to the user, the annoyances of the embedded spyware can take its toll on the user.

What are the motivations of the authors of freeware? Are the freeware authors truly altruistic? In many, but not all cases, the answer is "yes" and, indeed, the original spirit of the internet was a free sharing of knowledge, and many freeware authors see freeware as an opportunity to "return" something to the community which provided them with the excitement of enhanced knowledge and new skills. If financial concerns are not a consideration, and the freeware author has a source of income which possibly might be related to the theme of the freeware, then the pursuit and challenge of the creation of new software are sufficient to motivate the author. Professors in universities, professional and amateur software developers, students of computing disciplines, all these have a semi-altruistic spirit to create something that will be of benefit to society, without regard to a stream of income commensurate with their efforts. Sometimes the authors are residents of countries which do not have a strong commercial software audience, and the freeware titles represent a method for the authors to obtain world wide recognition.

On the other hand, we do have freeware developers who are seeking income from their efforts, and view the freeware being offered to the populace as a "loss leader" whose purpose is to acclimate the users to the "real" moneymaking software, and whet the appetite of the users to upgrade to a more full featured version of the software. However, it will often be the case that the freeware version will suffice to satisfy the needs of a particular user, with no need to upgrade to a full-featured version.

Two examples of freeware titles which serves as ostensible loss leaders, though their free versions have many significant powerful features which are often unmatched by commercially available software, are Treepad (http://www.treepad.com/) and Notetab (http://www.notetab.com/). Treepad is a unique PIM, database, organizer, text editor, which is part of a family of six products with Treepad in their title, one of which, Treepad Lite, is freeware. Notetab is a Notepad replacement, as well as an HTML editor, has an outstanding tabbed interface, and is part of a family of three products, one of which, Notetab Light, is freeware. Treepad Lite is from the Netherlands, while Notetab is from Switzerland.

There are numerous websites where freeware titles may be downloaded. Often these websites are dedicated solely to freeware, while at other websites, freeware and shareware are typically intermixed (much to the chagrin of shareware authors). Often, these websites distribute newsletters to their constituencies, informing them of the latest software titles. An example of a website which publishes mostly freeware titles, with a newsletter, is Tudogs (http://www.tudogs.com). (Tudogs, incidentally, stands for The Ultimate Directory of Gratuitous Software.) An example of a company which distributes both freeware and shareware is TuCows (http://www.tucows.com), which stands for "The Ultimate Collection of Winsock Software." Tucows is now a publicly owned company. Both Tudogs and Tucows have a rating system for their software titles (an ordinal scale, using dogs and cows, respectively!), but no explicit feedback from users of the software titles.

In our WebCenter, we are using the term freeware to be consistent with the commonly understood meaning of the term. Freeware shall include not only the traditional software titles considered freeware, but we shall expand the term to include any software titles which are available to students and faculty with no obligatory payment. Thus, while shareware will not be included in the repository of our WebCenter (since there is an obligatory payment after a preliminary trial period), donationware, postcardware, and open-source titles will be included, as will be certain commercial software titles which the creators provide for free for educational usage.

2. SOFTWARE IN THE PEDAGOGICAL ENVIRONMENT

Instructional technology (including, but not limited to, software) is a four billion dollar market, though highly fragmented (Savukinas, 2002). Software can play a critical role in the learning environment, but budgetary allocations for such software at various school levels are subject to typical financial constraints, with the consequence that, despite good intentions, software piracy exists in schools in violation of copyrighted software agreements.

It is fairly well known that the Software and Information Industry Association (formerly the Software Publishers Association) has taken proactive steps to discourage the violation of such copyrights in the corporate workplace, and even Microsoft Corporation has recently been overly aggressive in its pursuit of school districts and educational institutions who violate the Microsoft copyright agreements (see the excellent opinion article in Computerworld (May 6, 2002) by N. Petreley: "The bully is a coward," at http://tinyurl.com/5s45z).

A viable alternative to costly commercial software is the freeware marketplace, and yet, educational institutions often ignore this resource treasure, and gravitate to the more costly commercially available software. Many pedagogical freeware titles provide comparable functionality to commercially available software, and "save" their work in popular formats. There is pedagogical freeware available for almost every subject in every discipline, as well as counterparts to commercially available products including productivity toolware applications, such as word processing, spreadsheets, multimedia design, database management, presentation tools, etc. There is also pedagogical freeware which is still localized in the hands of the creators (often educators) who lack an effective means of distributing their programming efforts to other educators who could utilize the software. So, we have a challenge from two perspectives - to "educate the educators" as to the availability of such software, as well as to provide a convenient repository and forum which would encourage the development and distribution of locally developed pedagogical freeware.

These represent some of the motivations behind the design of our Pedagogical Freeware Collaborative Review WebCenter, both to serve as a repository for such freeware, and, moreover, to serve as a collaborative review mechanism whereby new learners and new users can benefit from the experience of experienced users and all can benefit from the interactions within this learning community.

3. TOWARDS A TAXONOMY FOR PEDAGOGICAL SOFTWARE

An essential component of a repository system, which would provide users the capability to readily view and retrieve freeware titles pertinent to their interests, would be a taxonomical classification scheme for such software. There is currently no taxonomy available for software, particularly pedagogically oriented freeware for students and instructors, and the authors have undertaken the task of designing their own taxonomy for the purpose of this effort.

The development of our taxonomy has been motivated by several taxonomy schemes used by the federal government with the objective of classifying educational programs. The original classification scheme, the Higher Education General Information Survey (HEGIS) series, was developed in the 1970s to provide comprehensive information on various aspects of postsecondary education in the United States. HEGIS provided classification codes for every academic discipline typically taught at American secondary schools and institutions of higher education. The HEGIS was replaced in 1979-80 by the Classification of Instructional Program (CIP), produced by the U.S. Department of Education's National Center for Education Statistics. Revisions to CIP occurred in 1985 and 1990, and the 2000 edition of the CIP (National Center for Educational Statistics) represents the third for pedagogical purposes, particularly when classifying software by academic discipline. Since much of the pedagogical freeware is used for instructing subjects in computing related disciplines (such as Information Systems), we have also incorporated the ACM-IEEE Computing Classification System in our taxonomy for computing related subjects (http://tinyurl.com/5or3y).

For each academic discipline, using a 3-level classification scheme motivated by Deek (Deek et al., 2000) and Pienaar (Pienaar, 1997) we have partitioned the functionality of a software title into three subcategories:

- Drill and practice: These software titles provide practice for defined skills and generate immediate feedback for the student, with usually some form of correction. The actual skills and knowledge are often taught through some other media, and are reinforced via interaction with the drill and practice software.
- Tutorials: Software titles presenting information and concepts for the student, which will be verified and reinforced through numerous examples and illustrations via interaction with the computer
- Simulations: This category refers to software titles which use simulations to approximate, replicate, or emulate the features of some concept, principle, task, setting, system, or context, often (but not necessarily) in a scientific area.

The creation of our taxonomy did necessitate certain compromises – ideally, in a taxonomy, the classification categories will be mutually exclusive, i.e., it should not be possible for a particular freeware title to fall into more than one category. However, Knowledge cannot, and should not, be compartmentalized in such a manner, and thus our taxonomy does acknowledge that some freeware titles could conceivably fit into more than one category revision and presents an updated taxonomy of instructional program classifications and descriptions.

We have used some of these aforementioned taxonomies to create our freeware taxonomy Our taxonomy has four high-level classifications:

I. Discipline Specific Freeware
II. Discipline Independent Instructor Pedagogical Freeware
III. Discipline Independent Student Pedagogical Freeware
IV. Utility Freeware

Category I, the Discipline Specific Freeware, considers the entire spectrum of typical academic disciplines for which freeware has generally been developed specifically for courses within that discipline. In categories II and III, we consider discipline-independent freeware which has specifically been developed for instructors (such as gradebooks) and discipline-independent freeware which students will find useful in their courses and curricula. (The discipline-independent freeware in category III will also be useful to instructors, but students

will be the primary focus.) Lastly, Category IV will contain freeware titles concerning various utilities, such as virus checkers, file management programs, etc. (Our philosophy is that educators maintain a responsibility in teaching our students to practice "safe" computing and to maintain a library of utilities for their computing environment, and thus these freeware utilities will be an essential component of the "pedagogical" freeware available to our students.)

Our taxonomy for pedagogical freeware is thus as follows:

I. Discipline Specific Freeware (Note: under every numeric in Discipline Specific Freeware will be the following 3 subcategories (as illustrated for Economics)):
- i) Drill and Practice Systems
- ii) Tutorial Systems
- iii) Simulations
- A Social Science
  1. Economics
     - i) Drill and Practice Systems
     - ii) Tutorial Systems
     - iii) Simulations
  2. Political Science
  3. Psychology
  4. Sociology/Anthropology
  5. Cultural Studies
  6. Journalism Communic.
  7. Law
  8. Law Enforcement
  9. Public Administration
  10. Miscellaneous
- B Mathematics/Statistics
  1. Algebra/Trig./Geometry
  2. Calculus
  3. Differential Equations
  4. Linear Algebra
  5. Probability Stochastic Proc
  6. Statistics (Descript/Infer)
  7. Regression/ANOVA
  8. Nonparametric Statistics
  9. Miscellaneous
- C Sciences
  1. Physics
  2. Chemistry
  3. Biology
  4. Geology
  5. Astronomy
  6. Nursing
  7. Dentistry
  8. Pharmacy
  9. Medicine
  10. Veterinary Medicine
  11. Speech Pathology
  12. Physical Therapy
  13. Miscellaneous
- D Humanities/Literature
  1. English Language
  2. English Literature
  3. Comparative Literature
  4. Linguistics
  5. Philosophy
  6. Religion & Theology
  7. Classics
  8. Miscellaneous
- E Foreign Language
  1. ESL
  2. French
  3. Spanish
  4. Italian
  5. German
  6. Latin
  7. Russian
  8. Chinese
  9. Japanese
  10. Greek
  11. Hebrew
  12. Arabic
  13. Indian
  14. Korean
  15. Portuguese
  16. Turkish
  17. Other
- F Management/Business
  1. Accounting
  2. Finance
  3. Management Science/OR
  4. Marketing
  5. Real Estate
  6. Labor Industrial Relations
  7. International Business
  8. Other
- G Engineering
  1. Electrical Engineering
  2. Chemical Engineering
  3. Mechanical Engineering
  4. Civil Engineering
  5. Industrial Engineering
  6. Nuclear Engineering
  7. Biomedical Engineering
  8. Other engineering
- H Fine Arts
  1. Art
  2. Music
  3. Photography
  4. Cinematography
  5. Other
- I Computing
  1. Hardware&Comp. Sys

2. Software/Software Eng.
3. Data
4. Theory of Computation
5. Mathematics of Comput.
6. Info.Tech. & Inf. Sys.
7. Computing Method.
8. Computer Applications
9. Computing Milieux

J Miscellaneous

II. Discipline Independent Instructor Pedagogical Toolware

A. Class Management Systems
B. Gradebooks
C. Test Generation Systems
D. Authoring- Presentation Software
E. CAI Software
F. Discussion,Discourse,Groupware
G. Other

III. Discipline Independent Student Pedagogical Freeware

A. Comprehensive Office Freeware
B. Word Processing
C. Editors/Thesauri/Dictionaries/Spell Checks/CrosswordPuzzleGenerators
D. Spreadsheets/Database
E. Graphics/Multimedia Freeware
F. Network/Communication
G. Presentation Freeware
H. Web Toolware
I. Other

IV. Utilities

A. Virus Protection
B. Spyware Protection
C. File Management
D. Personal Info. Management
E. Compression
F. Memory Management
G. Diagnostics
H. Other

4. DESIGN GOALS FOR THE PEDAGOGICAL FREEWARE COLLABORATIVE REVIEW WEBCENTER

The Pedagogical Freeware Collaborative Review WebCenter (http://tinyurl.com/4lbg8) is basically intended to foster collaborative learning about freeware use among instructors and students who want to use freeware more effectively and efficiently. This WebCenter is not merely a simple repository of freeware. Rather, it is designed as a forum where users share information about how to use freeware titles in the pedagogical environment. In other words, the Webcenter is aimed at facilitating information sharing about pedagogical freeware use to enhance learning effectiveness.

The design of the WebCenter is grounded on constructivism, which posits that people internalize their new experiences based on their past experiences or knowledge (Crowther, 1999). The constructivist approach views that knowledge is actively constructed by the learner, and that learning takes place when the outside world is organized and adapted to the learner's experiences (Gadanidis, 1994). Constructivists call for more emphasis on engaging students in the process of learning, than on finding a single correct answer (Roblyer et al., 1996).

Collaborative learning, which our WebCenter is intended to foster, is one type of learning process based on the constructivist approach. What distinguishes collaborative learning is that it involves socio-psychological mechanisms, such as self-explanation, internalization and appropriation (Dillenbourg and Schneider, 1995), which help learners actively enhance their learning effectiveness. Above all, collaboration is a social structure involving interaction between people, having a positive effect on them (Dillenbourg et al., 1996). According to Alavi (1994), collaborative learning produces a positive learning outcome through several stages:

i) increased involvement
ii) enhanced problem-solving ability and critical thinking
iii) improved learning and academic achievement
iv) higher student satisfaction with learning and classroom experiences.

Based on this theoretical background, the Pedagogical Freeware Collaborative Review WebCenter is aimed at facilitating collaborative learning among freeware users to help them use freeware more effectively and efficiently. Although there are many websites providing freeware titles, the number of websites is very few which provide information on how to use them based on collaborative efforts of users. Many of them are used as repositories of freeware titles without information or tips about how

to use them. Our WebCenter is distinguished from others in that it sets the stage for collaborative learning among users about freeware use for educational purposes.

In order to increase the effectiveness and efficiency of collaborative evaluation of freeware titles, every freeware title contributed is categorized based on our aforementioned pedagogical software taxonomy. Also, users are invited to evaluate each freeware title in terms of its ease of use and usefulness. The basic concept of this evaluation is based on the Technology Acceptance Model (TAM) which suggests that beliefs and attitudes of users toward a technology will influence their adoption of the technology (Davis, 1989). As a user acceptance model of a technology, TAM has long been studied in the information technology literature (Mathieson, 1991; Adams et al., 1992; Bagozzi et al., 1992; Szajna, 1994; Chin and Gopal, 1995; Gefen and Straub, 1997; Venkatesh, 2000; Venkatesh and Morris, 2000).

In line with the concept of collaborative learning, the WebCenter is designed to facilitate interaction among freeware users. Thus, every user is strongly encouraged to comment upon freeware titles listed on the website, or provide actual experiences and applications which they used for their teaching or learning, to help others utilize the freeware titles. Above all, these collaborative review efforts are intended to increase the overall benefits of freeware use by gathering hands-on information on pedagogical freeware experiences.

5. WEBCENTER FUNCTIONALITY

Since our WebCenter is intended to set the stage for fostering an environment where people interested in pedagogical freeware titles learn from each other, the focus of the WebCenter lies in facilitating people's interactions in freeware evaluation and application sharing. Thus, functionalities of this WebCenter are designed and aimed at increasing user participation in the WebCenter.

The Webcenter has five menu choices: Home, Contribute, List & Review, Sample Lesson, and Search (see Figure 1). The Home page briefly introduces the WebCenter and speaks about its purposes. The Contribute page allows users to contribute pedagogical freeware titles which can enhance the learning process of learners or the teaching procedures of instructors. Freeware titles are categorized based on the pedagogical taxonomy discussed in Section 3 for efficient storage/search of freeware titles. Contributed freeware titles can be searched in the Search menu based on freeware title names or the pedagogical taxonomy we have developed.

The List & Reviews page shows a (structured) list of all freeware titles contributed by users. Users can view a detailed description of each freeware title, including its system requirements, major purpose, etc. In the description page for each freeware title, users can review the freeware title to share their experiences of using the title (see Figure 2). Based on the collaborative review, users can get information whether the title is apropos to their purposes and pedagogical environment. Since the WebCenter categorizes freeware titles contributed based on our pedagogical taxonomy, users can get information on freeware titles very effectively and efficiently. Also, the collaborative reviews provide users with some vicarious experiences of using freeware titles.

While the List & Review menu allows users to see all freeware titles contributed to the Webcenter and check information on the freeware titles themselves, the Sample Lesson menu provides information on how freeware titles can be used in the actual pedagogical setting. In the Sample Lesson page, contributors can share their experiences as to how freeware titles can be used in classrooms more effectively and efficiently. Since the menu is intended to help users get some tips about how to use freeware titles contributed in the WebCenter, contributors of sample lessons first need to contribute the freeware titles if they are not found in the WebCenter. Sample lessons are also reviewed collaboratively to help users who want to use freeware titles in their classroom or pedagogical materials and improve the ways of using freeware titles in teaching. Also, this WebCenter facilitates exchange of information on how to use freeware titles in the actual pedagogical

environment. Each sample lesson contribution can help those who have a similar need to the author of the sample lesson. Collaborative reviews of sample lessons can expand the application of freeware titles, since reviewers could provide tips or insights which were not considered originally in the sample lesson.

6. CONCLUSIONS AND FUTURE WORK

It is our desire for the Pedagogical Freeware Collaborative Review WebCenter concept to provide a significant educational framework and resource for both students and faculty from a variety of disciplines. The inherent networking features for collaboration will enhance the overall capabilities of the WebCenter. The prototype we have designed, which will be available to the entire educational community, will also serve as a test bed for an ongoing iterative research process to fully understand the software requirements of students and teachers in various disciplines, and to better understand the dynamics of collaborative learning of software tools.

7. REFERENCES

Adams, D. A., R. R. Nelson and P. A. Todd, 1992. "Perceived Usefulness, Ease of Use and Usage of Information Technology: A Replication." MIS Quarterly, 16 (2), 227-250.

Alavi, M.,1994,. "Computer-Mediated Collaborative Learning: An Empirical Evaluation." MIS Quarterly, 18 (2), 159-174.

Bagozzi, R. P., F. D. Davis and P. R. Warshaw, 1992. "Development and test of a theory of technological learning and usage." Human Relations, 45 (7), 659-686.

Chin, W. and A. Gopal, 1995. "Adoption Intention in GSS: Relative Importance of Beliefs." DATA BASE, 26 (2&3), 42-63.

Crowther, D. T.,1999. "Cooperating with Constructivism." Journal of College Science, 29 (1), 17-23.

Davis, F. D.,1989. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." MIS Quarterly, 13 (3), 319-339.

Deek, F. P., K. Ho and H. Ramadhan, 2000. "A Critical Analysis and Evaluation of Web-Based Environments for Program Development." Journal of Internet and Higher Education, 3 (4), 223-269.

Dillenbourg, P., M. Baker, A. Blaye and C. O'Malley,1996. "The evolution of research on collaborative learning." In Spada, E. and Reiman, P. (Eds), Learning in Humans and Machine: Towards an interdisciplinary learning science. Oxford: Elsevier

Dillenbourg, P. and D. Schneider,1995. "Mediating the Mechanisms Which Make Collaborative Learning Sometimes Effective." International Journal of Educational Telecommunications, 1 (2/3), 131-146.

Gadanidis, G., 1994. "Deconstructing Constructivism." The Mathematics Teacher, 87 (2), 91-97.

Gefen, D. and D. W. Straub, 1997. "Gender Differences in the Perception and Use of E-mail: An Extension to the Technology Acceptance Model." MIS Quarterly, 21 (4), 389-400.

Mathieson, K. , 1991. "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory Planned Behavior." Information Systems Research, 2 173-191.

National Center for Educational Statistics, 2002, U.S. Department of Education - Office of Educational Research and Improvement.

Pienaar, H., 1997. "Relationship between Gagne's Nine Instructional Events and Educational Software." In Hiela's Web Index (http://tinyurl.com/5l5o5)

Roblyer, M. D., J. Edwards and M. A. Havriluk, 1996. "Learning Theories and Integrating Models." In (Eds), Integrating Educational Technology into Teaching. Prentice Hall

Savukinas, J. , 2002, "E-Learning " Impacts of IT on Education," Digital Economy 2002, Economics and Statistics Administration, U.S. Department of Commerce, February 2002. pp. 59-64.

Szajna, B., 1994. "Software Evaluation and Choice: Predictive Validation of the Technology Acceptance Instrument." MIS Quarterly, 18 (3), 319-324.

Venkatesh, V., 2000. "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model." Information Systems Research, 11 (4), 342-265.

Venkatesh, V. and M. G. Morris, 2000. "Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior." MIS Quarterly, 24 (1), 115-139.

Figure 1. Pedagogical Freeware Collaborative Review Site Map

Figure 2. Description and collaborative reviews of a freeware title