THE ONLINE TOP-DOWN MODELING MODEL

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The Internet has become a major resource for teaching and learning. Educators are innovating methods and strategies to integrate Internet technology effectively into instruction to meet their various needs. Providing learning models and facilitations online for a graduate computer literacy class was a new innovation, and generated interesting issues and insights. Students were impacted by the benefits and effectiveness of this new model. This article uses qualitative action research to explore a new model, or a new approach, to integrating Internet technology into instruction: the Online Top-Down Modeling Model (OTMM). This model combined external online instructional resources and internal online instructional resources to set up models and provide learning resources for classroom instruction. This research yielded overall positive responses from the participants about learning under the OTMM. The students' attitudes toward integrating Internet resources positively changed, and their confidence in integrating Internet technology into instruction increased. Ultimately, the class itself became a model for the class participants in how to effectively integrate Internet technology for instruction.

INTRODUCTION

With the development of technology integration in school settings, the quality of technology used for instruction has become a major issue to educators who are making efforts to innovate education. Bitter and Pierson (2002) assert that there are five stages of integrating technology into education: the entry stage, the adoption stage, the adaptation stage, the appropriation stage, and the invention stage. The final stage, the invention stage, is considered the highest level of integration, where teachers creatively invent their technology methods that are to be effective for learning. The technology-assisted environment expands the implication of learning practices and theories, and offers educators a large arena for imaging, planning, and creating a variety of ways to enhance the quality of learning.

From the social learning perspective, observational learning plays an important role in

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achieving successful learning outcomes (Bandura, 1977, 1986). To facilitate observational learning, observable models and behaviors must be provided. When the observer's (the learner's) curiosity and interest are aroused, he or she will be engaged in imitating the model's behavior if the model possesses characteristics or traits—things such as talent, intelligence, power, personal values, good looks, or popularity—that the observer finds attractive or desirable (Anderson, 2002b). However, observational learning is not simply a thoughtless imitating behavior. It involves higher-order thinking as the learning process develops, and it rewards the learner when the creativity and inventions are engendered on the learner's side (Tucker-Ladd, n.d.). It depends on how a teacher harnesses this magic to make a difference.

The Internet has been considered an effective tool for delivering instruction. The quality of online interaction with the learning resource is vital to successful teaching and learning as researchers have indicated in terms of learning in distance education classes (Milton, 1998; Muirhead, 1999; Oblinger & Rush, 1997). Learner-content interaction has been frequently discussed (Moore, 1989), but teacher-content interaction has received less attention. To take advantage of the Internet, educators are trying to put learning and instructional resources online to facilitate education. For instance, a Web portfolio is a way of putting students' e-portfolios (i.e., papers, discussions, projects, etc.) online to show what students have learned (Kimball, 2003). Developing a curriculum web enables the teacher to put his/her instructional materials online and access them anytime they are needed (Cunningham & Billingsley, 2003). Many educational Web sites discuss how to use the Internet to deliver information for distance instruction, but few of them mention how to take advantage of the Internet to create a teacher-prepared resource-rich Web site for traditional classroom instruction. Creatively integrating Internet technology into the traditional classroom has been bypassed while people are highlighting the

Au: Add Moore to reference list.

relationship between the Internet and distance education (Anderson, 2002b). In the current educational setting, where the majority of the instruction is still in the traditional classroom, strengthening the integration of Internet technology in the traditional classroom is fundamentally important.

In discussing instructional strategies, Marold (2002) indicates that the bottom-up approach fits well with the electronic information system tutelage model, in which graduate students construct their learning experience by doing hands-on work. Yet, from an information processing perspective, the first step in learning is to successfully gain attention (Morrison & Lowther, 2002). The top-down strategy is regarded as effective in gaining attention for instructional content and has been frequently used in instructional design (Fullan, 1994). In reading programs, people have used the top-down method to design effective and time-saving reading classes and tutorials for elementary students (Boothe, Walter, & Waters, 1999).

Materials designed to facilitate online learning through the transfer of the top-down modeling strategy to technology-assisted instruction offers opportunities to focus students' attention on the intended learning content and the expected outcome. Because of computer and Internet capabilities with multimedia programs and digital file formats, teacher-prepared top-down modeling resources online could be more vivid, interesting, stimulating, and relevant to the students' learning tasks. Imitable model digital projects and supporting resources could spur meaningful incentives to learners, and online tutorials/FAQs could structure a supportive scaffold in a networked environment. From mimicry and reproduction to creativity and invention, the environment of model-rich facilitation could tap the learners' potential and foster their creative minds, helping them reach an extended learning goal and become more productive learners.

This article discusses the use of online learning models and resources in a traditional

graduate classroom-based computer literacy course (FED 529: Computer-Based Instructional Technology) in the school of education in a mid-size Southern land-grant university. It reveals insights about the effectiveness of integrating Internet technology in a traditional computer literacy class by providing models and support through the Internet to motivate students to learn. The data were collected and analyzed from the perspectives and experiences of both the teacher and the learners.

This article regards the strategy for integrating Internet technology to provide models (samples) and facilitations for learners as a model—the Online Top-Down Modeling Model (OTMM). This model is related to the issues of instructional design, instructional strategy, Internet integration, and Web page design. "An instructional model is based on research that has been done on how people best learn certain kinds of information.… It is a series of steps or techniques for presenting information in a way that helps learners remember and use it" (Thorsen, 2003, p. 6). We will present a series of steps and techniques that are components of the OTMM, and then present participants' feedback for data analysis.

STATEMENT OF THE PROBLEM

Students struggle when searching for models in a technology-assisted learning environment, so they often feel uncomfortable and inefficient when switching to this new learning paradigm (Alessi & Trollip, 2001; Anderson & Garrison, 1998). Educators are trying to improve the delivery of models to students in this environment. The traditional way of providing models for a computer literacy class is via the paper printout or demonstrating digital projects through an LCD projector from a computer disk drive in the class. Both are often time consuming and have limitations in variation and diversity, as well as having constraints with time, location, materials and instant support. Learners expect better resources and

facilitations in a computer literacy class. The Online Top-Down Modeling Model is a technology-assisted instructional model designed to alleviate the current problems and enhance learning and teaching in a traditional graduate computer literacy class.

IMPORTANCE OF THE STUDY

Learning is more effective when it is conducted in a socially supportive milieu (Bandura, 1969, 1977). Discovery learning, observational learning, and scaffolding could be adopted to facilitate effective social learning and produce deeper understanding. Learning through modeling is an effective approach to inspire the learner's interests and motivations and results in deeper understanding (Stauffer, 1996). In the digital project-based computer literacy classroom, using technology's functions and strengths to maximize the impact of modeling and making models available anytime and anywhere would be conducive due to time, resource, and learning effectiveness. In the computer literacy class, students need to see models to arouse their interests and motivations. The Internet provides a good venue for teachers to exert their capabilities, imagination, and creativity to revamp the traditional means of providing models and support to the learners.

The Online Top-Down Modeling Model (OTMM) in this article refers to the use of model projects or samples online to involve learners and facilitate active participation in learning activities. In addition, the hands-on tutorials and resources for projects are provided online at the scheduled time alongside the assigned tasks. As we know, online stores have intriguing artistic Web sites to attract customers. Companies like Adobe have good online tutorials to help customers learn how to use their products, like Photoshop. The OTMM combines the two strategies and transfers them to develop an instructional Web site enriched with academic content and educational resources to maximize learning in a tra-

ditional class. The FED 529 course Web site is designed mainly as a learning task-focused resource. It contains all the models and samples needed for the FED 529 class. Learners can observe the products of previous students' work online as models and start to learn and construct their own artifacts. Detailed technical guidance is provided as technical "breakdowns" located in FAQ and video FAQ tutorials in the "Schedule/FAQ" section of the Web site. This support constitutes an instant learning facilitation to supplement the teacher's limited individual support for each student in or out of class. This Web-hosted resource is essentially an e-warehouse where multimedia files and projects can be stored, retrieved, updated, and revised according to on-going classroom needs. Scaffolding by modeling and supporting was adopted by taking advantage of this e-warehouse. The top-down modeling not only gives students the whole and completed projects to spur their interest and motivation for setting goals for learning new skills, but it also shows how to break the project into small units technically to help them master each related technique and skill during the assignments, overcoming the frustration and intimidation that often arise in a computer literacy class. How effective this new model was had become an interesting issue. The researchers in this study decided to track the FED 529 class for one semester to qualitatively discover answers to this question.

METHODS

This case study used a qualitative approach. The traditional quantitative paradigm has often been criticized for depending too much on numbers, which lack sufficient content and disregard human interaction (Kim, 1989; Merriam, 1988). According to the qualitative researcher's perspective, the world is a highly subjective phenomenon which is in need of interpretation and human understanding. Researches conducted through interpersonal communication could yield a better explana-

tion in multiple facets (Creswell, 2003; Lindlof, 1995). Research about advances with learning technology, which moved the inhuman machine to an e-communication tool among humans, could be better interpreted by using a qualitative research approach.

PURPOSE OF THE STUDY

The purpose of this study was to determine the effectiveness of the Online Top-Down Modeling Model (OTMM) in the FED 529: Computer-Based Instructional Technology class, a graduate level course. The research question in this study was how effective the Online Top-Down Modeling Model was for both the students and the teacher. This study used two sessions of the same course, FED 529: Computer-Based Instructional Technology, as a case for action research. There were 43 student participants in the two classes and one teacher participant who taught both classes. The data were collected through interviews, surveys, and observation to uncover the participants' experiences, perspectives, beliefs, values, and attitudes toward using instructional technology in the OTMM to achieve learning goals. The data were then analyzed to determine the findings and implications.

FINDINGS

The instructor, Dr. Lee, has taught FED 529 Computer-Based Instructional Technology in a traditional class environment for 3 years. This course is mainly a hands-on, project-based computer literacy class, with the use of a textbook— *Teaching and Learning with Technology* (Lever-Duffy, McDonald, & Mizell, 2003)—to learn the current trends, perspectives, and strategies of computer-assisted instruction. To renovate the instructional method, Dr. Lee designed and integrated his instructional Web site into his class starting in the summer of 2003, along with Blackboard, an online course management system.

There were a total of 45 students enrolled for the two sections of the course, two of whom dropped out. FED 529 is a traditional computer literacy class conducted in the classroom. The assignments, discussion, project rubrics, and tests were available in Blackboard online. In addition, Dr. Lee used his Web site (http://stuinfo.aamu.edu/shali/home/index.htm) as the class instructional site to provide both external and internal online resources as a supplement to his instruction. The purpose of this Web site was to support the students of FED 529 with resources for learning tasks in and out of the class, and to support the teacher with teacher-prepared online instructional materials for teaching in class. The students in these two classes were predominantly preservice teachers and in-service teachers. Their technology background varied. Many of them were novice technology users and had concerns about learning and integrating technology. One student mentioned in the Entrance Survey, "I am afraid of technology. In my school, I just avoid computers in class. I am afraid that I will not be able to keep up [with the class]." Another student said, "I am absolutely horrible at using technology to learn, regardless of the time given. My main concern about this class is the amount of work we have to do in such a short period of time." To take away the students' intimidation and concerns, and to motivate them to learn effectively, Dr. Lee tried to make this class interesting, motivating, and inspiring with rich content by integrating his renovated Web site. He designed his Web site as a model-rich e-warehouse with technical support ready online. We defined this approach of integrating online models in instruction as the Online Top-Down Modeling Model (OTMM).

The uniqueness of this model, or approach, was that it utilized a variety of model projects and the teacher-prepared multimedia resources online to facilitate students during their hands-on projects and, at the same time, offered the detailed technical guidance or support through FAQ and video FAQ. In addition, the FED 529 course Web site provided collections of hyperlinks to other people's instructional Web sites (e.g., BrainyBetty's and Kathy's multimedia Web site, etc.) to broaden the students' vision of multimedia design for instruction. The design of this Web site was user-friendly. It was easy for students to navigate and follow the examples provided from the internal and external Web resources. This approach made it easy for students to better understand the rubrics, requirements, and multimedia capabilities relating to the hands-on assignments and the expected outcome. The Web site worked along with Blackboard, but students reported that they used this site more often than Blackboard, which needed a password and user name for access, and more time to get familiar with it. Students found more information and learning resources on the FED 529 Web site than those in Blackboard (see Table 1).

On the FED 529 course Web site, the modeling pages contained the teacher's sample project and the previous students' model projects, such as the model projects of Lesson Plan, Flyer, PowerPoint Presentation, Web Page Design, Painting, Graphics Design, Digital Video Project, etc. The resource pages contained resource links to various subject-related information and resources provided on the teacher-prepared pages and on other people's sites, such as instructional Web sites, sound clip resources, clip arts, photo sites, and the
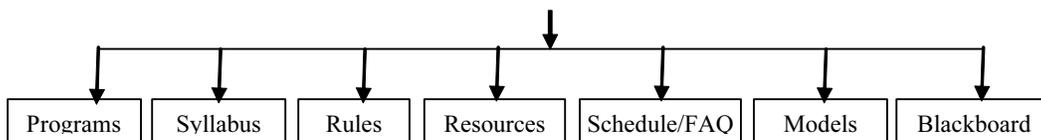

FIGURE 1
The FED 529 Instructional Web Site Map

TABLE 1
Main Components on the FED 529 Course Web Site

Guidelines	Information	Models and Resources	Multimedia Resources	FAQ Support
• Course requirements • Class and lab rules • Guidelines • Rubrics • Procedures • Assignments • Comprehensive exam guide	• Program information • Syllabus • Announcements • Assignments, • Schedule • Project due dates • Blackboard link • Tests (in Blackboard) • Teacher contact information	• Student project samples • Models (e.g., PowerPoint, video, painting, projects for Microsoft Word, Power-Point, Excel, Access, web page design, reading reflection, painting, graphics design, photo editing, discussion • Term/research paper, APA style, sample research articles and dissertation related document files, sample proposal, sample dissertations in qualitative and quantitative formats, and educational statistic data online) • Comprehensive exam guide and sample comp questions and answers	• Clip art • Photo resources for photo editing • Sound clips & sound effect clips for multimedia projects like PowerPoint, video production, web page design • External multimedia resources sites like Brainy-betty's and Kathy's • Free PowerPoint templates online	• Search engine collection • FAQs & video FAQs • Links to other people's Web sites • Sample instructional resource site collection • Blackboard and teacher's hidden personal instructional resources (by clicking "Learning and Fun" on FED 529 home page).

PowerPoint template Web site, and so forth. This Web site was considered a virtual instructional e-warehouse where the instructor could make, link, store and retrieve teacher-prepared resources and resources from other Web sites for class instruction, facilitation, and support on specific learning tasks at any time and anywhere.

Today's classroom is typically filled with a mixture of traditional and nontraditional instruction (Gavrin & Enger, 1998). The OTMM, as a nontraditional approach, integrated Internet technology into a traditional computer literacy class. Traditional instruction and technology-integrated nontraditional instruction are combined. The E-learning resources were implemented as an effective supplement to classroom instruction. This model emphasized the "TOPS and DOWNS." The TOPS provided models and opportunities for modeling to students, letting students observe, enjoy, and think about the intended tasks and generate potential preference, questions and puzzles in their minds; the DOWNS provided learning support on specific tasks

which "broke down" the model project into small units or parts in FAQ so that the learners could better understand and learn the specific features, techniques, and skills. Since this class combined traditional and nontraditional approaches, we maintained a two-way instructional support for learning in class by offering the online "breakdown" FAQ tutoring alongside the face-to-face demonstration-tutoring by the teacher in class.

In a multimedia design class, Dr. Lee demonstrated the relationship between the new perspectives of integrating technology into instruction and multimedia design in a variety of content areas via a PowerPoint presentation. He opened his Web site and showed his students his own PowerPoint project sample and previous students' model projects downloaded from the Web site. Dr. Lee analyzed the main technical features and techniques on each slide of these project samples for the students; for example, graphics design, interface design, animation, sound insertion and video integration, etc. Following the presentation, Dr. Lee provided students the opportunities to explore

TABLE 2
Part of the FAQ in Scheduled Tasks

Week	Date	*Class Content (All assignments must be saved on disks and might be collected at the end of the semester for portfolio evaluation except discussion.)*	*Due Assignments*	*Cooperative Problem-Solving*
1	1/10-12	Introduction to Class Basic Skill Check Lesson Plan Models, FAQ 1, Video FAQ	Direction to download Video FAQ: Right click Video FAQ link, select Save Target As, at save box, choose save on desktop, then your file is saved on your desktop. Open video file from desktop to play it in Windows Media Player.	1. Use technology-aided resources to produce your lesson plan/unit plan for one content area.
2	1/17-19	Track Changes, Keyboarding Commands, Models, FAQ, Video FAQ		2. Categorize your teaching data in your portfolio, then retrieve and update them with new information and resources according to your class needs for a concession of three weeks.
3	1/24-26	Fliers/Trend and Perspectives of Ed Tech Models, FAQ, Video FAQ	Lesson plan due	
4	1/31-2/2	Mail Merge Learning Theories with Ed Tech Models, FAQ, Video FAQ	Track change due	

the project portfolio models posted on the Web site. Students seemed to have entered a virtual art museum plus concert, where varieties of visually appealing digital projects were displayed, with melodious music played and videos ran. The students were captivated by the beauty of the projects. They were brought into a new world where instruction and aesthetics were woven together. They were involved, immersed, motivated, and engaged. This was a "warm-up" prelude before a new project assignment. Student Allen, an in-service teacher, said, "I knew a little bit about PowerPoint before, but I've never seen other people's projects designed so beautifully and related to the content area so well. I'll try to learn all those skills and features to make my class presentation effective and interesting to my students."

As one of the important components in this class, teams of students were assigned to work together, collaborating on PowerPoint projects. They were reviewing the downloaded model projects from the course Web site, and taking notes on the new features. They were discussing, analyzing, and debating the design plan of their teamwork. They solved many ongoing problems by helping each other and viewing FAQs on the Web page. A remaining question about the PowerPoint animation features was posted on the discussion board in Blackboard, "Our team see[s] one sample project has used the animation scheme, which adds fun to the presentation. But we don't know how to change the graphic color while we are doing animation scheme in our teamwork. Can anybody help? Thanks." The next day, three replies appeared after this posting to explain how to do the animation in three different ways. The problem was solved, but students learned more than one way to add an animation scheme to a PowerPoint presentation. The FAQ support constituted another component of learning in this class. The text FAQ explained the skills or features in text, while the video FAQ presented the skills and features visually in Windows Media Player with oral narratives. It engaged students in learning activities. One student had problems downloading the video FAQ from the class Web site. She initiated an email conversation with the teacher, seeking technical support:

Good morning, Dr Lee,

   Sorry to bother you, but I wanted to get into your Web site to access the video FAQ, and see some of the PowerPoint [tutorial] presentations. I was unable to access the files. Could you please let me know how I can access it?… I would like to download some of the files. I found them to be very interesting and informative.
   Thank you.
   Mellon

On the same day, the teacher replied to this email:

Dear Mellon,

   I am happy you want to learn from the video FAQ tutorial. To open the files in the video FAQ, go to my homepage at http://stuinfo.aamu.edu/shali/home/index.htm, click SCHEDULE/FAQ, scroll down to the Video FAQ which relates to your project, right click on it, click Save Target As to save it on your computer desk top, then go to your computer desktop and double click on the video file icon to open it in Windows Media Player. The Windows Media Player will play the file in larger screen for you. Hope this helps.
   Best wishes,
   Dr. Lee

The FED 529 class Web site worked as an enhancement to instruction. The students were not only using the Web site for learning, but also experiencing personally the intrigues and benefits of manipulating the Internet for class.

The Schedule/FAQ page on the course Web site was frequently visited by students because it contained each class' objectives and assignments. The FAQs were placed together with each learning task on this page so that students found it easy to locate the technical support that explained the major skills in detail. The accompanying multimedia resources like clip art, photos, sound effects, music clips and online PowerPoint templates were ready at hand there. Placing the resource link close to the scheduled tasks allowed students to easily navigate between the class tasks and the resources at one's fingertip. Students could develop a sense of the relevance between learning and the prepared resources via technology while using technology for learning.

The FAQ had another impact on learning. When students had difficulties with the major features of the project they were doing after class, they could refer to the FAQs in the Schedule/FAQ section on the Web site, which textually explained skills in several steps. For some of the learners who preferred visual tutorials, the video FAQs were provided next to the textual FAQs so that they could make a choice to visually learn the steps showing on the computer interface and also hear the teacher's oral explanations delivered in the video demonstration. Since the FAQs were online, students could refer to them before class, during class, and after class any time and anywhere. Some of the students with lower levels of technology skills were required to preview the online FAQs before each class and review the FAQs after each class so that they could reinforce their learning within the assigned period of time. Some advanced students could learn all the skills within the class and did not have to refer to the FAQs unless they had missed the class or encountered some new problems.

All of the students reported that they reviewed and benefited from the sample projects online. All of the students reported that they benefited from the online project models, and 72% of the students reported that they referred to the FAQs to get online help, especially those students who were less independent in learning and needed more support. One student reported,

I was always able to see examples of students who previously took this class, which helped me understand what was expected of me. In the event that I forgot how to do an assignment, I referred back to the FAQ Web site to see the models and tutorials again at home to finish my project according to the requirement.

Another said, "it was great to see other students' work as well as the teacher's examples…. When you get to see samples, you have a better idea of what is expect[ed] of you, and

it gives you a variety of ways an assignment could be accomplished." With the help of the online models/samples, students broadened their horizons, accelerated their understanding of the requirements, and set up their goals and plans to learn and design their own projects with higher self-expectations, resulting in a higher level of thinking, such as comprehension, application, analysis, synthesis, and evaluation, and better project outcome. Furthermore, during model analysis, students not only saw the positive impact of the models, but could also discuss the downside of each model, which was equally helpful in allowing them to develop their own projects. For instance, one model PowerPoint project was excellent except for its unpaced background music. The teacher examined its animation steps to discover its design flaws, analyzed them, and demonstrated how to fix the problems, helping students understand and avoid the same problems in their own work. The online FAQs also offered tutorials by providing visual input, aural input, and verbal analysis, which adapts to students' different learning styles and learning preferences to help students of different backgrounds learn at equally comfortable levels (Alessi & Trollip, 2001).

The OTMM promoted independent learning as well as cooperative learning. Students could view the models and FAQs as many times as needed in class or at home. The FAQs, either in textual format or in video format, could be played back and stopped to replay at any selected section. For example, students who felt shy in asking questions could get support and privately solve their problems on their own with the help of FAQ resources. Bitter and Pierson (2002) indicate that to effectively integrate technology into learning, the quantity of using technology for learning and the feedback of the learners' attitude and experiences about using technology are important. According to the students' survey feedback, the frequency of students using the FED 529 course Web site and their attitude toward the benefit of using it are listed in Table 3.

This course Web site was the cradle of OTMM where resources were designed and provided, and learning activities occurred. Its uniqueness was that it had the multiple functions needed by the teacher and students, as listed below:

- Multiple models for facilitation
- Rich resources for teaching and learning
- Ease of use
- Learner-controlled process
- Just-in-time help
- An e-warehouse
- Student-centered learning
- High level of learning
- Bottom-up—the rewarding phase
- The teacher-content interaction

Multiple Models for Facilitation

Students learn more effectively when they learn by observing other people's models (Bandura, 1986; Stauffer, 1996). The OTMM Web site was designed to provide ample models, samples, and project resources for students to observe and create their own experience after the models. Through the whole process of projecting, mimicking, collaborating, and inventing on the student side, students were led to experiencing and understanding the use of an instructional Web site for their own class in public schools. Since this class used a two way support—the classroom face-to-face support and the online resource support—it made students feel that learning in FED 529 was not a "lonely" activity, but an activity that was supported anytime and anywhere. The students' feedback on the effectiveness of the instructional approach in this class is mirrored in Table 4.

Rich Resources for Teaching and Learning

This Web site contained almost all digital instructional resources online (see Table I). The instructor could access them at any time in his class if needed for instruction. Students

TABLE 3
The Students' Feedback on Using the OTMM Web Site

No.	Descriptions	
1.	Have you ever used the FED 529 course Web site?	
	Yes	100%
	No	0%
2.	How often did you use this Web site?	
	Never	0%
	Rarely	0%
	Sometimes when I needed to do the projects for this class	32%
	I used it quite often to do the projects in this class	50%
	Quite often. I used it not only for this class projects, but also for the things outside the class	27%
3.	How much have you benefited from this Web site?	
	A lot	68%
	Some	32%
	Very little	0%
	None	0%
4.	Check the things on the website that you think are valuable to you.	
	Sound/music resources	77%
	Graphics resources	73%
	The students' project models	100%
	FAQs	72%
	Video clips	59%
	Photo resources	64%
	Search engine collection	91%
	Course introduction	77%
	Syllabus	77%
	Links to the online instructional Web sites made by other people	86%

TABLE 4
Students' Responses about Using the Web Site as a Model and Support Resource

1. It is nothing better than to see a sample of what we are supposed to do.… It serves as a visual guide. It gave me great examples to go by. I am so grateful for this Web site.

2. The Web site is very informative.… Whatever project we are doing in class, there is a sample posted on it.

3. With this Web site, I was able to practice the assignments prior to actually doing them.… I really wish that other teachers would consider doing Web sites, too. I think that all students should have the opportunity to see examples of the projects of classes as easy as by a click.

4. I think this site is beneficial to the students because not only is this site helpful, but also it gives examples of how technology can benefit a class.

5. The FAQs were exceptional.… The most interesting was the video FAQ that was easy to understand and easy to follow.… They helped me to review and finish projects at home.

6. I think this Web site is well organized and pleasant to look at. I didn't have a hard time navigating through it at all. The information on it is proved helpful for me throughout the course.… It is not time consuming. It makes you feel that computers are no longer frustrating to me because the support in class and FAQ guidance are provided clearly there.

7. I feel that the Web site is helpful for someone who does not understand or missed a class. They can have a general idea of what is expected of them.… It allows students to share the materials needed to collaborate on group assignments at any time.

8. I have access to the examples of other students' work from this Web site. It has helped me look at what someone else has designed for the assignments. It has been very beneficial to me because I am a very visual learner.

could observe the teacher teaching by using these resource materials. Since the online internal resources were teacher-made or teacher-prepared, the content and models/samples were more relevant to the students' learning tasks. One student compared his use of resources on another Web site and resources on the FED 529 Web site:

> I used to like to search the solutions to my assignment problems on the Internet. But sometimes you got it, sometimes you searched and got nothing out of it. It's frustrating when you spend time but don't get any thing exactly [like] what you want….That's why I prefer viewing the video FAQ in our class site. It guides you more in details and [is] understandable and reliable.

The students gave more responses about the benefit of getting supporting resources from the OTMM Web site; these comments are presented in Table 5.

Ease of Use

In the first class of each semester, the teacher showed the students the Web site and how to use it to get support. Students found the Web site easy to use and information-rich, particularly sample projects that previous classes had put online. The large files, such as those of PowerPoint, usually took a minute or more to download. The video project files were compressed into Windows Media Video file format, which reduces the file size to one tenth of its original size in AVI format. Most of the sound files on the Web were in MP3 or MIDI format, which was acceptable for Microsoft Office and required much less space and downloading time. Its Web pages were clearly

TABLE 5
The Students' Responses About the Web's Supporting Effectiveness

1. This Web site helps me with learning about how to effectively use track change, make flyers for class activities, and save time in doing mail-outs to parents by using mail merge to send letters. In conducting activities to do projects and assignments, this Web site gives a number of examples on various ways to do PowerPoint presentations, and using Excel to create charts and graphics.

2. It [This Web site] gave ideas and direction when I got stuck and in need of inspiration. I got to see all the neat ideas that previous students had come up with and got a fresh outlook on how I wanted to accomplish my tasks.

3. I used the examples on the Web site as a reference to help me complete assignments.… I also feel I have to depend on the students' work samples to create my own quality work.

4. It not only explains how to do the project, but shows us different samples visually. This help reaches all the different styles of learners in the class. Only some projects take longer time to download on my home computer through a phone line.

5. I feel that the Web site really relates to everything this class offers. The answers to all of your questions are in FAQ at your fingertip.

6. I used its examples of APA style writing to help me with my article reviews. I learned a lot from the PowerPoint information and I learned what others had done by examples posted on Dr. Li's Web page. It was also helpful to keep me current with what assignments were due through the Web page.

7. This web page provided a lot of good resources for our projects, saving me a lot of research time…. I used some of the sites or links to find music for a presentation project. I found many useful and helpful links on this site.

8. My school is in the process of developing a Web site where all of our teachers can use to post information such as assignments, syllabus, and others about classroom activities. I plan to use Dr. Li's format but make my part of the Web site as exciting as possible. Thanks to all I learned in this class. It is a great learning experience.

9. The Web site promotes variety, creativity and deeper learning experiences. It has a multiplicity of avenues to drive at a point. It also gives the teacher an opportunity to demonstrate more than one view point.

10. It is an excellent demonstration of technology in classroom teaching. It allows the teacher to access to the lessons each day. Therefore, he does not have to use his valuable in-class time to prepare the project or write out the content. He has them ready online now.

categorized. The buttons indicated all the major resources needed for the class as "advanced organizer" (Pressley et al., 1995). For example, students could click RESOURCES to get to the page that contained all the internal and external resources the teacher prepared for the class. They could click MODELS to get to the page that contained different model projects. If they clicked Schedule/FAQ, all the class schedules, assignments, and FAQs popped up in sequence with the class progress. In addition, the Schedule/FAQ page provided FAQs for the students on the specific tasks in each specific class during the whole semester. The video FAQs were made with Windows Media Encoder, which was downloadable free from the Microsoft Web site.

Learner-Controlled Process

The nonlinear navigation helped the learners learn, emulate, and work at their own pace and control. Students defined their own "Zone of Proximal Development" (Vygotsky, 1978), made their own plan, and retrieved models and supporting resources at any time and from anywhere according to their own interests and needs. It provided an environment that was conducive to constructivist learning, in which observation, discovery, collaboration, and trial-and-error were encouraged, and creativity fostered. This design helped minimize confusion in using the Web site.

Just-In-Time Help

Just-in-time help, in a sense of supporting students at the time when they expected it during their work, maintained a high level of student involvement in the learning process (Pressley & McCormick, 1995). It yielded an efficiency of providing support to the learners when they held a problem on hand, with their attention focused on it. The instructor guided the students to refer to the Web site to seek instant support to meet their immediate needs, and to reduce their frustration, and to develop

a good habit of making use of the available resources to develop their problem-solving skills. Peer support, teacher support, and Web FAQ support blended together to make their effectiveness felt. Even though all three types of support could be just-in-time, the teacher and the peer support had time and place constraints, while the online FAQ support was available any time and anywhere. This just-in-time support also helped alleviate computer multimedia intimidation, which was common among novice users, and also increased a sense of the relevance between online learning resources and the learning activities.

An E-Warehouse

The class Aebsite acted as an e-warehouse where digital resources, project files, and multimedia resources (photos, graphics, sounds, projects, FAQs, etc.) were stalled. It was not only accessible for the students, but also for the teacher to retrieve files in class, and to update the Web site. In addition, this online e-warehouse could be as large and as easy as needed for the instructors to modify to meet the students' growing needs, which arose on a regular basis as the class progressed.

Student-Centered Learning

The OTMM enhanced the student-centered learning in terms of observational learning, discovery learning, collaboration, and cooperation, with an emphasis on project-based problem solving strategies. For example, students often reported that they liked to discuss the use of PowerPoint features they saw in the online models relating to their own projects during their PowerPoint teamwork. Questions were often posted in the discussion board in Blackboard and e-mail listserv from students, such as "How can I make the slide transition as the sample presentation showed?", and "How did the student do their PowerPoint with video clips overlapping on each other but play one by one in presentation?" The instructor also indicated that he could use this Web site to present

instruction in a sequential order or in a nonsequential order, depending on his class' needs. For example, when teaching Web page design, he provided a model page that contained tables, graphics, animated graphics, hyperlinks, and related skills for the student to follow. He not only asked students to follow him in class to make a page after the model, but also left them to navigate among model Web pages to pick a preferred format to emulate.

High Level of Learning

Terry Anderson asserts that online interaction in distance education should reach a high level of learning, in which learning "1) results in looking at something in a new way, 2) addresses learners' needs, 3) motivates learners to spend time, 4) challenges learners to understand their own learning, and 5) frames understanding in multiple contexts" (Anderson, 2002a, p. 1). The OTMM here, even though it was not conducted in a distance learning class, also shared the values and benefits the online resources brought to learners. Therefore, this model could be transferred not only among traditional classrooms, but also to the distance classes where online resources and e-communication are heavily utilized. In addition, the OTMM supported not only learning the basic units of knowledge and skills, but also the higher level of learning and thinking generated by problem-solving processes and constructivist activities, such as the individualized activities and teamwork related to application, analysis, imagination, creativity, synthesis, and evaluation.

Bottom-Up—the Rewarding Phase

The students' own construction of learning played a vital role in achieving their goals. Through a series of project-based learning, the students could construct their own knowledge and skills as well as the models or better. The supporting components—facilitation from the teacher and peers, support from the resources prepared online, collaboration and brainstorm-

ing among the learners, and individuals' creativity—all counted toward the factors that led to their success. After the students' projects were made, evaluated, and selected as new models, they were added to the model Web site and enriched the online learning resource. The students were happy to see their own work in the honored model roles online, and their self-images were increased. At the end of the course, students had an open house to showcase their achievements and projects. Virtually all (97%) of the students indicated in the Exit Survey that they were proud of their own achievement after one semester of study, and 92% of the students were confident that they could learn well and teach well with technology after finishing the FED 529 course. Seeing each other's work posted online as new models became a powerful, meaningful, and relevant motivator and incentive in their endeavor to integrate technology into their own future educational career. This was a bottom-up result in the process of the OTMM. From top-down modeling to the successful bottom-up, there was a cyclic process in which learning occurred and success was achieved.

The Teacher-Content Interaction

With a click on the link marked with "Learning and Fun" on this course homepage, the teacher's resource page popped up; this was where the teacher prepared and uploaded instructional projects for class instruction only. This gave the teacher fingertip access to the prepared materials in the e-warehouse. It avoided the problems of forgetting to bring a disk to class, disk crashes, and virus infection. The teacher's resource link was "hidden" because when students rolled their mouse over it, the mouse point would not change to a "hand" to indicate a hyperlink, for it was prepared only for the instructor as "a private resource" for his class demonstration only. With this, the teacher could retrieve what he prepared for his class instruction at any time and from anywhere at a click.
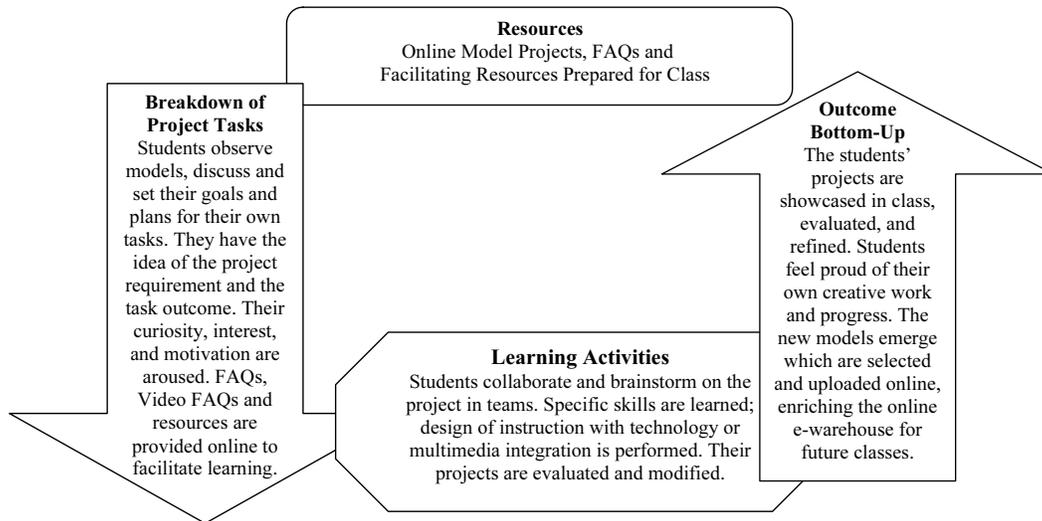
Resources
Online Model Projects, FAQs and
Facilitating Resources Prepared for Class

**Breakdown of
Project Tasks**
Students observe
models, discuss and
set their goals and
plans for their own
tasks. They have the
idea of the project
requirement and the
task outcome. Their
curiosity, interest,
and motivation are
aroused. FAQs,
Video FAQs and
resources are
provided online to
facilitate learning.

**Outcome
Bottom-Up**
The students'
projects are
showcased in class,
evaluated, and
refined. Students
feel proud of their
own creative work
and progress. The
new models emerge
which are selected
and uploaded online,
enriching the online
e-warehouse for
future classes.

Learning Activities
Students collaborate and brainstorm on the
project in teams. Specific skills are learned;
design of instruction with technology or
multimedia integration is performed. Their
projects are evaluated and modified.

FIGURE 2
The Cycle of the Online Top-Down Modeling Model

THE INSTRUCTOR'S PERSPECTIVES

The instructor, Dr. Lee, talked about how he developed this online top-down modeling model by integrating his instructional Web site. He said that he was happy to develop this Web site for classes, even though it took a lot of his weekends and spare time. He enjoyed creating new methods that worked effectively for classes with emerging technology. When he developed this Web site, he was determined to make a renovation to have all available Internet capabilities function well for the learning purpose. To let students access multiple models at the same time in the same classroom, putting the digital projects online was the only choice, because the web server was large and easy to access. In addition, regardless of how many people accessed the files during the class time, it worked well. Using CD-ROM could not achieve this effect. A Web site was easy to update, but a CD-ROM could not update files easily nor be distributed to all students effectively. When integrating this model, Dr. Lee also found himself becoming a model of how to integrate Internet technology into classroom instruction to his own students. According to the survey, students' feedback on his integration of Internet technology was very positive; many students even planned to create their own instructional Web site in the manner they experienced in FED 529.

Dr. Lee used the FTP tool (File Transfer Protocol) to upload all his Web files to the Internet. In addition, Microsoft Word (2000 version or newer) works directly with FTP to upload Web pages. This makes the creation and updating of Web pages very easy and convenient. The user needs only a basic level of Web design skills to do it. Dr. Lee commented about creating the OTMM Web site for his instruction:

> The question is that you need to start with an idea in your mind on how to make the Internet technology serve your instructional purposes. Creativity is important when you start designing it. I tried to find all the features that a Web page could provide to help me make the Internet work in the best possible manner.

When talking about the design for the models online, he added,

> I emphasize the models online because in one way I can attract the learner's interest to engage them, in the other way, I want to widen their vision and tap their talent to do good or better work. This approach shortened the 'Zone of the Proximal Development' between a novice learner and the experienced peers.

He trusted that this model could work well in many content area classes, even in classes in which there are limited computers. Dr. Lee also talked about the downside of using this model. He said,

> To work with the EITS (Office of the Computer Information Technology Service), I have to be patient. The workers there don't like faculty members to use so much space on the school's Web server. I received a warning that I used too much Web space. My web account might be cut off if I keep on increasing the use of my Web space in my account.

Dr. Lee expected that higher quality equipment would solve his conflict with the EITS. Also, Dr. Lee revealed that not every student liked to use this effective resource online, such as FAQs and video FAQs, even though they said that they liked to view the models. They would rather ask the teacher to give them individual help than take time to view the FAQs online on their own. However, a teacher has limited time to give individual support to each student during a class or after a class. Some of the students would like to leave the problems unsolved and turn in their assigned projects with flaws and unsatisfying elements. Those students were not in the habit of actively looking for the technology-provided resources that were prepared for them. The strength of the OTMM would not work on those students. To solve this problem, the instructor needed to devote time to developing those students' skills and abilities to use technology for learning.

As a whole, Dr. Lee regarded the OTMM as a successful model provider, a learning facilitator, and a supplement to his classroom instruction. It made the online facilitation rele-

vant, reliable, and available across time and space.

CONCLUSION

The Online Top-Down Modeling Model offered a new strategy of integrating Internet technology. It harnessed two ways of facilitation for both the classroom learners and the teacher: showing the models and providing specific technology tutorials for learners in the classroom. It combined the benefit of both traditional instruction and nontraditional instruction and involved learners more effectively, conveniently, and flexibly than regular computer literacy classes that used traditional CD-ROM files to present models and tutorials to the learners. The participants' attitude toward learning under this model was positive. Its impact on the students' learning to integrate technology into instruction was powerful and long-lasting, even though there were some minor frustrations during integration. For example, the higher-quality instructional files needed larger space and took longer to download. However, there is good news for solving this problem: IBM is designing a higher-speed networking system that is 40 times as fast as a T1 network. If this network system is equipped, the file downloading speed will be tremendously increased. Then we will be able to access large multimedia files at amazing speed, with highest quality. Then the OTMM e-warehouse will exert its strength and be easier to be implemented in any school settings. As Pressley (1995) said, creativity was the key to effective integration of the instructional technology. Where there is a will, there is a way.

Echoing Anderson (2002a), it was found to be true that the teacher-content interaction played an important role in technology-assisted instruction. This study demonstrated that the instructor-content interaction was designed on the premise of the instructor's relationship to the subject resources, including (1) the online external instructional resources

and (2) the online internal instructional resources. The instructor-made internal online resources played a vital role in OTMM and could be better geared to the content area he or she teaches for the class, and more relevant to the learners. The instructor could access it for the targeted instructional objectives for a specific teaching unit or task, and make any modifications and updates easily according to instructional needs. This study calls for further research on the effective use of the online internal resources (the teacher-made resources) and the quality integration of instructional technology.

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