Integrating Digital Images into the Art and Art History Curriculum

An Internet-based image database connects to an in-class teaching and learning tool for easy access to art

By **Sharon P. Pitt, Christina B. Updike**, and **Miriam E. Guthrie**

Digitizing slide collections for preservation or online accessibility is not a new concept for the visual arts. Art consortiums, representing not-for-profit organizations or for-profit companies, increasingly enable access to art and humanities images and data. Many image libraries are already accessible online, such as the Art Museum Image Consortium (AMICO) library, the Bridgeman Art Library from Grove's Dictionary of Art, Davis Art Slides, and Saskia Ltd. Cultural Documentation.[1] These image databases allow educational institutions to acquire, in an equitable, cost-effective manner, access to large repositories of digital content that meet specific curricular needs. Soon, even more sources of digital image collections will be available, such as the Andrew W. Mellon Foundation's ArtSTOR,[2] along with new methods, systems, or interfaces to view and manipulate those collections. More than any of these options, however, institutions of higher education need methods for collecting, sorting, storing, retrieving, and packaging digital images specifically for meaningful use in teaching and learning.

James Madison University (JMU) met the challenge of bringing digital images to the arts and humanities classroom. Funded by the Center for Instructional Technology's internal grant program, mGrants, the university designed an Internet-based image database system, connected to a flexible, in-class teaching and learning tool. The Madison Digital Image Database (MDID) incorporates images ranging from a single, faculty-owned slide to large, commercially licensed art databases.

Background

Using image sources and new media to supplement a fine-arts slide collection in teaching art history has become standard practice at many universities. Prior to the World Wide Web, videodisc image collections, such as *Perseus: Interactive Sources and Studies in Ancient Greece* by Gregory Crane and *American Art* from the National Gallery of Art, were used regularly in the classroom.

In 1996, the School of Art and Art History at JMU equipped its first technology classroom. The school's collection development policy expanded to include CD-ROM image collections. One product in particular proved useful: the Reindeer Company's *The Art Historian*, a

high-quality multimedia CD-ROM designed specifically to supplement college-level art history and art appreciation education. This CD-ROM allowed students and faculty to study and review art images and to project full-color images of art and architecture. However, it lacked the flexibility needed to organize art images to meet specific curricular requirements.

In 1997, the Visual Resources Center in the School of Art and Art History projected its inability to meet the demands of course sections and instructors added to meet requirements of the new General Education program. Not only would the physical collection not have enough slides to provide faculty with necessary teaching resources, but some slides were degrading in quality.

In 1998, the first year of the General Education program, survey of world art courses provided one of the few means for students to complete the arts and humanities requirements. The School of Art and Art History shifted from teaching 12 sections of the survey of world art courses per year to 24 survey course sections and 8 course sections of general art appreciation in the 1998–99 academic year.

Unable to acquire funding from traditional sources, the school turned to a university-sponsored technology grants program, proposing the development of a digitally based instructional system. Due to the enormous need and the lack of an alternative method to meet the teaching and learning needs of the increased number of students and faculty, the proposal was funded, and JMU began development of the MDID.

Production was compressed, with work beginning only a few months before 1,000 images were needed in the classroom. The project team, which included staff from the Center for Instructional Technology (CIT) and the faculty and staff who developed the proposal, was under extreme pressure to deliver the system. In addition to a challenging schedule, the creators had a low budget and a high learning curve.

In parallel, an instructional system was designed, and instructional content for the survey course sections was digitized by staff in the CIT. Images from the Visual Resources Center library, personal faculty collections, and licensed image sources were added to the system. By the fall of 1998, the system contained image and data content, and teaching of art survey courses began. With the underlying system developed, additional images from the Visual Resources Center and other disciplines could support teaching on broader art topics and even expand to a variety of disciplines.

Madison Digital Image Database

Though many databases provide the ability to search and access images, the MDID is also an elegant teaching and learning tool. Designing this tool has been a collaborative, long-term, and pedagogically focused process. The university continually responds to specific instructional concerns with ongoing redesign of the system, based on feedback from faculty and students who use it.

A Web site permits instructors to generate and package "slide shows" at their convenience — any time, any place. Instructors can search through thousands of digital images, selecting and sorting based on a range of instructional criteria. After organizing selected images for classroom presentation, instructors can store slide shows for immediate use in class, annotate and edit slide shows, provide online shows for student review, or archive slide shows for future discussion or testing.

Instructors access the MDID by logging in to a secure Web site. Once authenticated, instructors are transferred to a customized gateway that contains their image lectures. Once in this gateway, an

instructor can create a new slide show, review an existing slide show, or log out of the system. In addition, instructors can activate or archive a specific slide show to make it available or unavailable to their students. They can also select a specific slide show to annotate with personal notes, viewable by the students enrolled in the course.

To create a slide show, the instructor searches the database using specific search criteria. The fields used to describe works of art correspond directly to the Visual Resources Association (VRA) Core Categories Version 2.0. An instructor might type in the last name of an artist or a keyword, or perform general or specific searches using a range of instructional criteria. Consider the following search criteria, for example:

- The medium of "architecture"
- In the country of the "United States"
- In the "postmodernism" style

Once search criteria are determined and submitted, the system returns all results that meet those criteria. A search might generate a handful or hundreds of specific image results. The results page includes a small view of each retrieved image, its associated cataloging data, and a check box. The check box lets the instructor select the image for a slide show. The instructor scrolls through the results, selecting images to include in a lecture. Once all selections are made, the instructor sends those images to the Image Sorter, an online light table.

At the Image Sorter, the instructor can order, add, and discard images. Once the instructor is satisfied with the order of the images, the slide show is packaged and named for classroom projection or online study use. Any show may be viewed in class using the ImageViewer, a system component that permits instructors to download each image in the slide show and project those images in a computer- and presentation-enhanced classroom.

In the physical classroom, the instructor launches and logs in to the ImageViewer application. The system returns a list of active slide shows. The instructor then selects the lecture for that day. As in a traditional slide show, the images are displayed on a large projection screen, individually or side-by-side. Unlike a traditional slide show, the MDID provides functions such as enlarging and panning through images for closer inspection, plus accessing and projecting image data at the touch of a mouse. Faculty members also can split the screen horizontally or vertically for simultaneous comparison of two images, with each half retaining all features of a single-image slide show, including the zoom and pan features. Image data can be displayed, moved, or hidden. The instructor can navigate the ImageViewer using a remote mouse, attached mouse, or keyboard commands.

A student accesses the MDID by logging in to the MDID gateway. The system takes the student to the SlideShow Viewer, the MDID's student interface. From this page, the student can select and access a particular faculty member's lecture and/or learning path through the images. Not only does the student have access to the same images and cataloging data that the instructor showed in class, but the student also can access any notes or annotations provided by the instructor.

The cataloging system meets specifications and needs of faculty search criteria. During development of the system, art and art history faculty at JMU discussed common search practices and the minimum number of fields necessary to search and find the desired works of art. At JMU, those categories are creator's name, title of work, period, medium, style, culture, country, and keywords.

Content

In addition to robustness, the system needed content. At the beginning of the project, the curator of the Visual Resource Center, working hand-in-hand with faculty, chose content for the survey of art courses. Tasks included selecting, cataloging, and scanning images; demounting, remounting, and labeling slides; resizing digital images for inclusion in the system; and assessing and editing images for quality and accuracy. Scanning was outsourced to a photographic services company to meet time constraints.

Descriptive information on all images was placed in the database and is available in all components of the system. When using the ImageViewer in the classroom, this feature saves in-class time for faculty by providing appropriate spelling, dates, and pertinent information to students.

The labor-intensive method of image and data inclusion does not provide many images for immediate use, however. The ultimate objective at JMU was to provide a large body of images to meet instructional needs across a wide range of learning experiences. The system needed to support the mission of an art and art history program in which students develop a deep, global appreciation of art. Incorporating commercial collections of high-resolution images creates new avenues to build teaching libraries, so JMU made additional image content available via the licensing and incorporation of an image library. JMU selected the Art Museum Image Consortium (AMICO) library, which had the capacity to expand image availability more than tenfold.

In the spring of 2000, the library at JMU purchased a year-to-year site license of AMICO's database of almost 45,000 images and image records (as of 2002, the AMICO library houses 78,000 images). The Center for Instructional Technology (CIT) and the School of Art and Art History sought and received permission from AMICO to incorporate those images into the MDID.

The CIT purchased computer tapes of AMICO's high-resolution images and associated data. In the summer of 2000, the CIT uncompressed seven tapes with 40 gigabytes of information per tape, converted those images to JPEG, and sized each image for various uses in the MDID. Cataloging data was mapped and converted to a Microsoft SQL server database to interface with the Web-based and multimedia-based components of the system. A faculty query database was developed that allows instructors to choose AMICO images for addition to the MDID system. An administrative interface allows a curator to verify and edit text data before sending the images to the MDID system for instructional use.

Copyright Issues

Copyright law protects intellectual property. Any expressive work fixed in

a tangible, or touchable, medium is protected by copyright. In higher education, educators can generally use copyrighted works through four components of fair use, including the intended purpose of that use, the nature of the actual work, the portion of the work used, and the potential market value of that work.

Determining who owns the copyright to an image is difficult. Often, the copyright does not belong to the owner of the object, such as a private collector or a museum, but to the creator of that object. JMU has endeavored to protect the copyright owners of art by following Educational Multimedia Fair Use guidelines, developed as part of the CONFU (Conference on Fair Use), as project criteria. Though not law, these guidelines provided a reasonable foundation for MDID project development. Most important, JMU can ensure that the images in the system are used for an educational purpose, as all packaged lectures reside within an authenticated gateway, to which only JMU faculty, staff, or students have access.

As institutions seek to acquire more and more digital content with which to teach, the purchase of commercially licensed images will provide faculty and students with access to a large set of images for teaching and learning, while protecting the institution from potential liability.

Ensuring System Effectiveness

Developing the MDID required investments in servers, technology classrooms, high-end projection equipment, and an appropriate network. Production activities included database and client application development and the development of training workshops, documentation, and help modules. Content development activities included selecting and reviewing needed images, scanning images, preparing images for outsourcing, developing search criteria, editing images for content, editing images for use within the overall application, creating a digital image collection policy, and integrating commercial image libraries with the MDID database infrastructure.[3]

Ongoing costs arise from maintenance activities. These include server maintenance (backup and service package updates), system and account administration, update and input of image records, help desk support, training, and collection development.

A variety of specialists worked on MDID development and implementation. The team included art and art history faculty, a visual resources specialist, project managers, a librarian with expertise in metadata, server administrators, technology classroom designers, facility managers, audio-visual system experts, a graphic designer with expertise in image editing, graphical user interface experts, multimedia specialists, and Web developers.

Instructional Impact

The act of digitizing images preserves them permanently in the digital realm. Editing those images with the guidance of a subject matter expert maintains their integrity as accurate representations of the original works of art. In addition, the image undergoes no physical damage through use, whether by instructors, students, or the technology used to display it.

In the fall of 1998, instructors at JMU were surveyed to determine preparation issues surrounding art instruction. At that time, faculty in the School of Art and Art History made minimal use of technology, despite an interest in integrating Web technologies into teaching and learning. In addition, faculty felt that access to and use of physical slides within the Visual Resources Center was reasonably effective, efficient, and organized.

Faculty use of teaching systems like the MDID can substantially decrease the amount of time spent on individual tasks while preparing for instruction. With the MDID, instructors can search the database online, receive instantaneous results, and immediately select and organize these results to create a learning path through the images. Database use also eliminates refiling slides for both the Visual Resources Center and faculty.

By placing an image in the MDID, an instructor can share and access a personally owned image for instruction, without burdening an individual or an individual's collection. Online, faculty can search through tens of thousands of images and organize them into classroom lectures, independent of the Visual Resources Center's schedule — the traditional educational resource of art and art history faculty. Recent interviews with instructors indicate that with less physical time spent searching, selecting, and organizing slides, faculty use the saved time to add information to their lectures or perform scholastic research.

The system promotes year-to-year productivity as well. Images stored in a digital database can be recalled by search criteria not tied to chapter and figure numbers. As universities and art schools select new textbooks or adopt new editions of textbooks, one image from the book can be acquired and then accessed by all instructors who use that book to teach a topic. In the MDID system, that one digital image can provide all the detail images for a particular work, as well, thanks to the zoom capability.

Also in the fall of 1998, students were surveyed to determine their thoughts about image accessibility. Students had little access to art images or 35mm slides outside of the textbook purchased for a particular class. Often, the textbook images were not the images used in the classroom lecture. Access to lecture images consisted mainly of printed postcards, tacked on a classroom or hallway bulletin board. In the survey, students indicated that access to the 35mm slides was inefficient, unreliable, and inconvenient.

In using the MDID, faculty members no longer need to select, locate, and organize prints or images for student review. Students have online access to correct, instructor-packaged images. This level of access provides an enhanced learning environment. Tavy D. Aherne, Assistant Professor of Art and Art History, describes her students' use of the system:

> They [the students] can have easy access to images not found in their textbooks, which gives me greater choice and creativity in constructing lectures, assignments, exams. This is particularly important with regards to teaching the arts of Africa, Oceania, and the Americas, where few textbook options exist. In the past,

the slides of artworks discussed in class would not be accessible to students outside the classroom. The students could see the works only once in class, and then briefly during an exam review. Now they can call up the artworks and take time to really study them, to see them.[4]

Descriptive data is available in the classroom with the click of a wireless mouse, saving in-class time for faculty and providing accurate information to students. Students can print lectures and faculty notes so that class time can focus on interaction, not the spelling of art objects' or artists' names. Wrote Kathryn Monger, Assistant Professor of Art and Art History at JMU, "I have raised my expectations of what my students can learn."[5]

In addition to productivity benefits, faculty and students using the database system reap the advantages of viewing works of art in new ways. In the ImageViewer, faculty can enlarge a high-resolution image, showing details of a specific image without pixelation or having to display and navigate through multiple detail slides. This zooming capability not only maintains the viewing continuity, but instructors do not need to request detail images because they can magnify any portion of an image. Annotation features eliminate an historical separation between image and lecture notes, providing a sustainable, easily stored and accessed instructional outline for each image lecture.

Within the ImageViewer, the magnification tool encourages movement within an image, removing its static quality. The tool acts like a camera in a documentary, allowing the instructor to tour students through a map, around a frieze, or across a tapestry. Discussion can take place at points of interest without breaking a student's attention or an image's fluidity. Interiors of buildings can juxtapose with their exteriors. Details of images can be shown with the larger work. Similar art subjects with different expressions can be compared, contrasted, and manipulated. Because each image has been reviewed, edited, and approved by an art history expert, instructors and students can always access the best image of a work of art from a variety of image collections.

Other instructional benefits include the ability to

- View art over time, placing a painting, sculpture or building in context and in a moment.
- Share personal images taken while traveling abroad or on site.
- Present many views of a single work of art, enhancing the context and accuracy of student learning.

Sharing the MDID

On October 10, 2001, James Madison University released the Madison Digital Image Database to the academic community. Since that date, more than 200 universities and colleges, foundations, nonprofit organizations, corporations, government offices, and individuals have downloaded the application for a variety of education purposes. Uses cited span teaching with art images to organizing and displaying New York City Water Supply images of Petri dishes.

A comprehensive informational Web site outlines the application's features and documents current technical and infrastructure needed to use it.[6] No technical support is provided on the MDID; however, a users' list has been developed to foster a community through which users can acquire support.

As more and more users downloaded and installed the application, it became clear that more flexible licensing, or even open source distribution, might be needed. For other institutions to use the MDID effectively might require changes in the application, depending on an organization's intended use and the prevalent technical infrastructure within that organization. In recognition of that need, JMU is working on flexible options for licensing.

Evaluation

Evaluation of the application is designed to provide qualitative and quantitative data to inform redesign activities, plus information on demographics, usage statistics, and instructional impact. This instructional system offers an example of how technology can positively influence faculty and student success when appropriately integrated into the teaching and learning process.

Student surveys, designed by staff in the Center for Instructional Technology, were distributed in the spring of 1999 and the fall of 2000 to students in art survey courses. In the summer of 2000, the system was redesigned to incorporate instructional needs of both faculty and students using the system. The time frame in which students were surveyed crosses the period between initial design and system redesign. The responses from more than 300 students in both groups indicate that the system was very useful in the classroom. Highlights from the gathered data appear in Table 1.

In the spring of 2001, staff in the Center for Instructional Technology redesigned the assessment instrument, and staff in the Office for Assessment and Research Studies reviewed it. The new instrument incorporated questions about new features available in the MDID and addressed potential concerns with previous assessment instruments.

By the spring of 2001, art history instructors indicated a greater comfort level in using the system, comfort with the stability of the system and the campus network, confidence that the computer-enhanced classrooms were stable, and confidence that the university had invested in the latest and best projection technologies for displaying images. In the spring semester of 2001, 402 students in the survey of art sections, taught by five different instructors, responded. In the fall semester of 2001, nine courses were surveyed for a total of 657 respondents. The survey included students who participated not only in art survey courses, but in a general art course and two course sections of African studies. Two of the nine associated faculty rarely used the system in the classroom, but made their traditional lectures available to students for study online via the Slideshow Viewer feature of the MDID.

Highlights of the results, compiled by staff in the Center for Instructional Technology, appear in Table 2.

Table 1

Responses of Spring 1999 and Fall 2000 Students

Question		Valid Percent Spring 1999, N = 316	Valid Percent Fall 2000, N = 355
General Usage			
Frequency of slideshow use per month	One to four times	59%	68%
	Five or more times	19%	29%
Quality of online images	Unsatisfactory	5%	5%
	Satisfactory	95%	95%
Amount of information for each image	Satisfactory	71%	77%
	Unsatisfactory	29%	23%
Instructional Impact			
Effect on learning content	Hindered tremendously	0%	2%
	Hindered somewhat	2%	2%
	Had no effect	22%	11%
	Helped somewhat	45%	36%
	Helped tremendously	31%	49%
Effect on interest in art/art history	Hindered tremendously	0%	2%
	Hindered somewhat	1%	2%
	Had no effect	53%	32%
	Helped somewhat	35%	39%
	Helped tremendously	11%	25%
Effect on success in course	Hindered tremendously	1%	2%
	Hindered somewhat	2%	2%
	Had no effect	35%	22%
	Helped somewhat	39%	38%
	Helped tremendously	23%	36%

Lessons Learned

The MDID has flourished. Currently, the system supports more than 30 faculty members teaching over 3,000 students per year. The system supports instruction in courses from art history to the art of non-Western cultures.

The initial project, however, was a stopgap measure to support two general education courses with multiple course sections. The university has expanded the robust underlying system to support additional disciplines. Content added to the system makes it useful in preparing future artists, educating globally aware art historians, supporting the accreditation of art teachers, and enriching the general education of non-art majors.

Education about technology and its integration into the teaching and learning process is critical for all project stakeholders. Design of instructional systems, however, is increasingly collaborative. It involves not only instructional designers and faculty, but also providers and supporters of the institution's technological infrastructure — from technical trainers to network designers to audio-visual specialists. With the MDID, involvement of technology classroom managers and audio-visual specialists came late. Inclusion of all potential stakeholders at the onset of the project would have provided a smoother road for ongoing development.

As in any design process, sometimes the accidents of design become the most powerful features of the system (in MDID, the dynamic viewing of maps and friezes). Capturing accidents along with intended design in the application requires assessment of users. As more faculty and students use the system, more changes seem indicated. Moreover, instructional design is a dynamic process that requires regular evaluation of project objectives and redesign of the instructional product.

Clearly, the development of an innovative instructional system impacts the university's academic technology infrastructure. Already, faculty members are demanding additional technology classrooms in which to use this teaching tool. Instructors also understand the types of technology they want in these classrooms — the best projectors to teach the visual arts, more computer memory for faster access to the server images, development to make the system a better teaching tool for all art history courses and for disciplines beyond art history, and more images in the database.

Ongoing collaborations have been the key to this project's success. Faculty and staff in the School of Art and Art History provide ongoing feedback to system creators through focus groups and departmental meetings. Faculty members distribute and collect student surveys in their classrooms each semester. Faculty suggest content to add to the system. The Visual Resources curator works in concert with the CIT staff addressing ongoing issues, including copyright concerns, acquisition of image libraries, user training, classroom facilities, and more.

Use of the database not only encourages the integration of technology into teaching and learning, it also facilitates an interdisciplinary exchange of knowledge and instructional innovation. The opportunity to share slide and image collections among departments and divisions enhances the teaching experience of JMU faculty and the learning experience of JMU students in fields such as anthropology, history, literature, media arts and design, philosophy, and more. Faculty in the School of Art and Art History, the humanities, history, media arts and design, philosophy, sociology, Asian studies, Latin American studies, American studies, religion, and even math have used the system. Faculty polled in the School of Art and Art History are keenly interested in expanding the image database and share a growing interest in learning how to integrate technology, software, and particularly the World Wide Web into instruction. *e*

Table 2

Responses of Spring and Fall 2001 Students*

Question	Valid Percent, Spring 2001 (*N*=402)	Valid Percent, Fall 2001 (*N*=657)
Do you own a computer?		
Yes	95.3%	96.2%
No	4.7%	3.6%
Can you access the Internet from the computer you use most often?		
Yes	98.2%	98.2%
No	1.8%	1.4%
How often does your instructor use the ImageViewer to show digital images?		
Every class	85.2%	77.2%
Don't recall	4.5%	14.4%
1–2 times a month	5.8%	5.1%
Weekly	4.0%	2.4%
On average, how often did you view your instructor's SlideShows outside of class?		
1–2 times a month	48.5%	43.4%
Once a week	31.8%	30.9%
Less than weekly	10.9%	13.0%
Rarely	7.7%	12.2%
When preparing for exams, how useful is it to review the online SlideShows outside of class?		
Very useful	80.5%	72.3%
Often useful	13.5%	17.3%
Occasionally useful	4.0%	5.9%
Rarely useful	1.0%	2.0%
Not applicable	0.7%	2.4%
When learning course content, how useful is the instructor's implementation of the ImageViewer in class?		
Very useful	58.8%	51.4%
Often useful	26.0%	27.0%
Occasionally useful	8.3%	7.9%
Not applicable	5.0%	12.0%
Rarely useful	1.8%	1.7%
When learning course content, how useful is it for you to review the SlideShows outside of class?		
Very useful	42.6%	40.7%
Often useful	31.6%	29.6%
Occasionally useful	16.0%	20.0%
Rarely useful	7.5%	5.3%
Not applicable	2.0%	4.3%
How does your use of the SlideShows outside of class affect your interest in Art and Art History?		
Often useful	30.8%	29.1%
Occasionally useful	29.3%	28.7%
Very useful	18.5%	17.0%
Not applicable	11.8%	12.6%
Rarely useful	9.5%	12.6%
How does your instructor's use of the projected digital images in class affect your grades for this course?		
Very useful	44.7%	35.4%
Often useful	35.2%	31.1%
Occasionally useful	10.1%	15.5%
Not applicable	7.0%	15.2%
Rarely useful	2.8%	2.8%
How does your use of the SlideShows outside of class influence your grades for this course?		
Very useful	48.2%	46.2%
Often useful	32.5%	27.9%
Occasionally useful	11.9%	17.1%
Not applicable	4.8%	5.0%
Rarely useful	2.3%	3.8%

* Organized by highest percentage response of Spring 2001 students

Acknowledgment

This article builds upon work initially presented by Pitt and Guthrie at EDUCAUSE 1999. The conference proceedings paper, "Digitally Invested: Teaching and Learning with Online Images," is available at <http://www.educause.edu/ir/library/html/edu9940/edu9940.html>.

Endnotes

1. See the following URLs for more information about AMICO, <http://www.amico.org>; the Bridgeman Art Library, <http://bal-ms.bridgeman.co.uk/>; Davis Art Slides, <http://www.davis-art.com/artslides/>; and Saskia Ltd. Cultural Documentation, <http://www.saskia.com>.
2. For more information about ArtSTOR, see <http://www.mellon.org/artstor%20announcement.html>.
3. More information about technical specifications and infrastructure needed to use the MDID can be found at <http://cit.jmu.edu/mdidinfo/support/techspecs.pdf>.
4. T. Aherne, e-mail communication (Feb. 2001).
5. K. Monger, e-mail communication (Feb. 2001).
6. Features and technical specifications of the MDID can be found at <http://cit.jmu.edu/mdidinfo>.

Sharon P. Pitt (sharon_pitt@ncsu.edu) is Director of Learning Technology Service at North Carolina State University in Raleigh. At the writing of this article, she was Director of Instructional Technology and Distance Learning at James Madison University. Christina B. Updike (updikecb@jmu.edu) is the Visual Resources Specialist for the School of Art and Art History at James Madison University in Harrisonburg, Virgina. Miriam E. Guthrie (mguthrie@vt.edu) is Coordinator of Special Initiatives, Outreach, and Marketing at Virginia Tech in Blacksburg, Virginia. Guthrie was Director of JMU's mGrants Program.