Using Digital Images in Teaching and Learning

Perspectives from Liberal Arts Institutions

by David Green

Executive Summary

Report commissioned by
NITLE and Wesleyan University

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The project, initiated and designed by a team at Wesleyan University, had early and valuable encouragement and advice from Bryan Alexander, then director of NITLE's Center for Educational Technology (CET) in Middlebury, Vermont, and was subsequently moved into reality and significantly shaped by his successor, Amy McGill. Amy was responsible for expanding the scale of the project from a handful of colleges to the wide spectrum represented in this report. Amy joined Michael Roy, Dan Schnaidt, Rob Lancefield (all from Wesleyan University) and consultant David Green on the executive committee that steered this project to fruition. Manolis Kaparakis, Wesleyan's academic computing manager for social sciences, gave invaluable assistance in preparing, processing and delivering results from the online survey.

Thanks go to the 404 faculty members who completed the online survey and to the more than 300 faculty and staff who participated in individual and group interviews; without them this study would not exist. The institutional contacts at each of the 33 participating institutions (listed in Appendix One) worked tirelessly to elicit support from their faculty and to ensure that survey participation and the interview schedule proceeded without a hitch. Thanks to them all for their dedication and perspicacity.

Finally, this report would not have achieved its final seamlessness were it not for the flair and persistence of its editor, Jennifer Curran, managing editor of Academic Commons.

1 Introduction

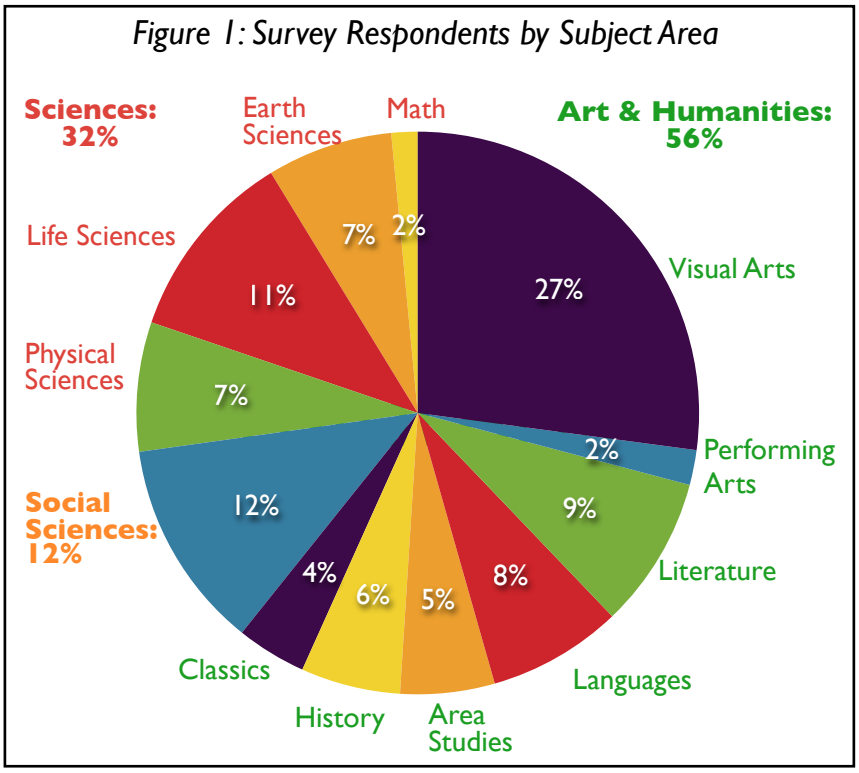
Digital images are revolutionizing teaching and learning at the college level, in and out of the classroom. Nonetheless, many support and infrastructure issues still need to be resolved before their deployment can be considered effective.

This study, commissioned by Wesleyan University in collaboration with the National Institute for Technology and Liberal Education (NITLE), focuses on the pedagogical implications of the widespread use of the digital format. However, while changes in the teaching-learning dynamic and the teacher-student relationship were at the core of the study, related issues concerning supply, support and infrastructure rapidly became part of its fabric. These topics include the quality of image resources, image functionality, management, deployment and the skills required for optimum use (digital and image "literacies").

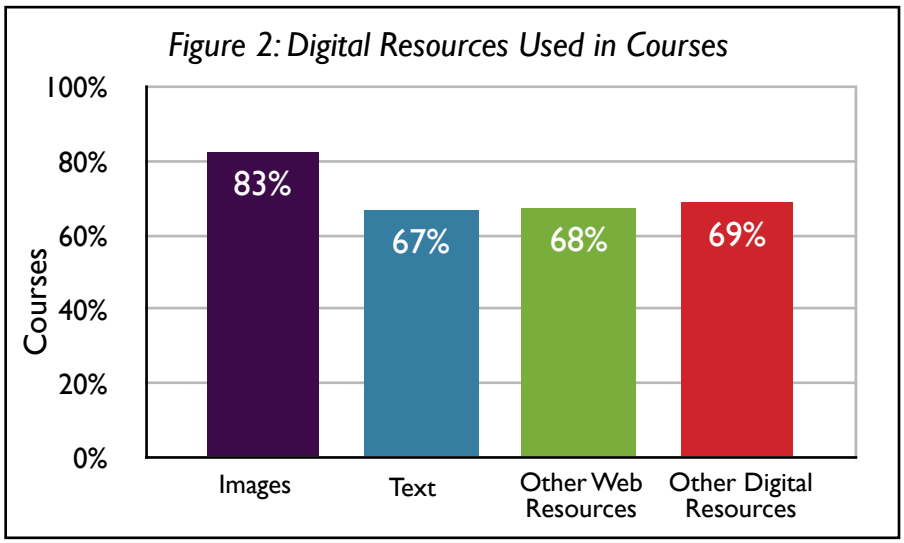
Our findings extend those of related studies. The Pennsylvania State University's "Visual Image User Study" (VIUS, 2003), RLG's "Out of the Database, Into the Classroom" (2005), and the University of California at Berkeley's "Digital Resource Study" (2006) aimed to understand and improve the use of existing digital resources on campus in order to maximize return on investment in producing or licensing them. In addition, a 2006 NITLE report, "The Visual Resources Environment at Liberal Arts Colleges," interested in why the use of digital images was transformative on some campuses more than others, focused on determining issues of institutional structure and campus culture.[1]

This report is rooted in faculty experience in "going digital," as shown in 400 survey responses and 300 individual interviews with faculty and some staff at 33 colleges and universities: 31 liberal arts colleges together with Harvard and Yale Universities. Two-thirds of the survey respondents worked in the arts and humanities, 27% in the sciences and 12% in the social sciences (Figure 1). These faculty were self-selected and mostly convinced of the digital promise of abundant, fluid resources. They wanted to communicate both their enthusiasm for their endeavor and their frustration at the pace and quality of their transition to teaching with this new format. Faculty overall

[1] Penn State's VIUS report was published September 2003 at http://www.libraries.psu.edu/vius/; RLG's "Out of the Database, Into the Classroom" was published February 2005 at http://www.rlg.org/en/page.php?Page_ID=406; the Berkeley study, "Use and Users of Digital Resources: A Focus on Undergraduate Education in the Humanities and Social Sciences," in April 2006, at http://repositories.cdlib.org/cshe/CSHE-11-06/; and "The Visual Resources Environment at Liberal Arts Colleges" was published in April 2006 at http://www.nitle.org/index.php/nitle/transformations/2006_4_3.



reported using digital images in 83% of the courses they taught (Figure 2). While this is not a representative sampling of all faculty teaching at all institutions, these results clearly chart important new trends and policy questions that need to be addressed, as well as reinforcing the results of other studies.[2]



[2] The full report, with supporting material, is available at the website of Academic Commons (http://www.academiccommons.org), a forum created in 2005 to examine the relationships between new technologies and liberal education.

2. Image Sources

2.1 Personal Collections

Faculty use digital images primarily from their own or others' personal collections or discovered on the Web, using Google Images or some similar search tool (Figure 3).

Over 90% use their own personal collections; this is the source most "always" used (17%). While some of these collections are built around specific niche interests (images that, as one art historian put it "would never be in an institutional collection"), or out of a desire to capture a great variety of different kinds of images, others are built more out of frustration at the pace of construction of institutional collections. Many faculty need considerable assistance in organizing and managing these collections. The Berkeley study also noted the need for management tools that could integrate images from all sources for re-use. In fact, the authors were "struck by the fact that most faculty may be adrift until these technical promises can be fulfilled."[3] It was clear from our interviews and survey responses that faculty's personal digital image collections are here to stay and that more institutions need to recognize this by providing some of the cataloging and management tools required.

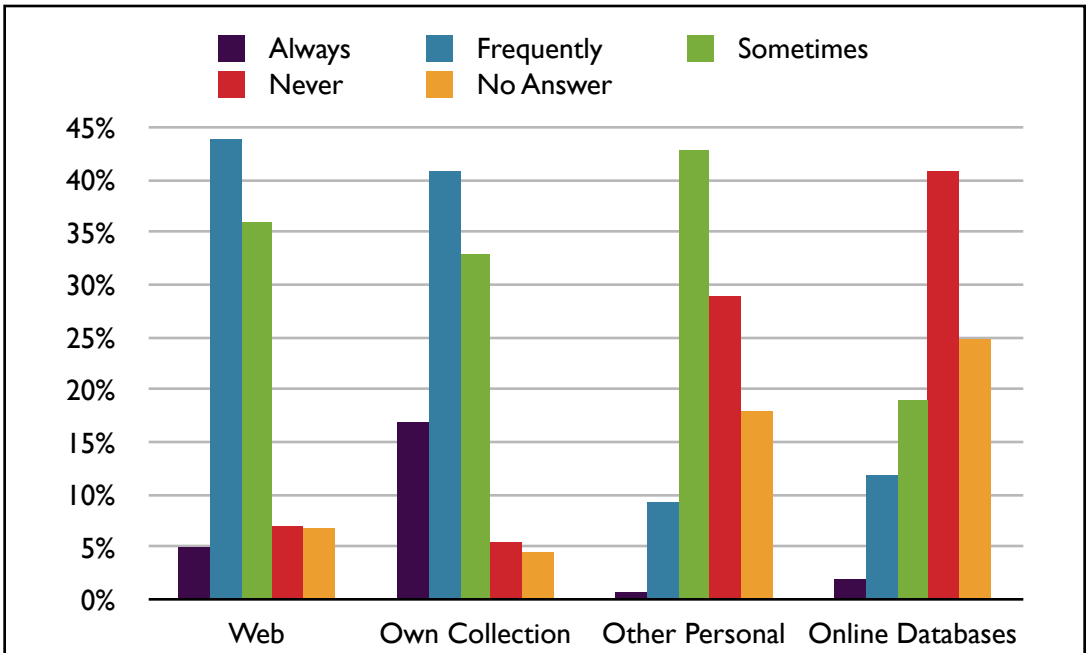


Figure 3: Sources of Digital Images Used in Teaching - I

[3] See http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1075&context=cshe, page 8-3. See also Christine Borgman's work on this issue, for example, in her paper, "Personal Digital Libraries: Creating Individual Spaces For Innovation," delivered as part of the NSF Post-Digital Libraries Futures Workshop, June 15-17, 2003; see http://www.sis.pitt.edu/~dlwkshop/paper_borgman.html.

Recommendation 1: Develop and share tools and services to assist faculty in organizing, cataloging and managing their personal digital collections, in a user-centered content model.

A related issue is the need to define the relationship between individual faculty collections and emerging institutional collections. Some institutional collections emerge simply as a result of bringing several individual collections together on a common server, while others are more consciously created around an existing art-history-based visual resources center. Whatever the individual genesis of these two types of collections, it will be important to clearly define the relationship between them, and to create policy and implement standards (metadata, rights status, etc.) and software that will assist in the controlled migration of images between the two. As one art historian commented, "The interface of those two collections and their compatibility is really, really crucial."

Recommendation 2: Locally, create policy that defines, encourages and enhances the relationship between individual personal digital image collections and the evolving institutional collection.

2.2 Online Resources

While faculty often celebrated the abundance of digital images that could be found online via image search engines, there was a call for more dependable, high quality resources than those typically turned up in a "Google Images" search, that are easy to use and combine with images from other sources. In fact there are many free online databases of images that have been assembled by cultural institutions, government agencies or scholarly associations, but they are often unknown by these image-using faculty; only a third reported using them (2% always, 12% frequently, 19% sometimes). Ironically, such databases were persistently called-for in the interviews. The structure established by the National Science Digital Library (NSDL, see below), to create peer-reviewed discipline-based teaching resources by working with designated lead societies, seems a good and productive system, but too few faculty seemed aware of the resources. Often a good resource would be discovered by accident or via an image search engine. Many asked for better filters, directories or portals for such national or international resources. (See the list of faculty-recommended resources in Appendix Two of the full report. In addition, an ongoing version, to which all are invited to contribute, appears on Academic Commons; see footnote 2).

Recommendation 3: Nationally, establish informal discipline-based boards, filters, wikis or portals to publicize and direct users to especially good online image resources in any given subject area. Locally, direct faculty to such resources.

2.3 Shared Resources

Some faculty create their own resources and like the idea of being able to share them. Possibilities include creating one's own website, submitting images to a wiki[4] or a site where contributions can be critiqued and information added by others, or contributing to the image collections of a national resource, such as the National Science Digital Library.[5] In addition, while some faculty informally exchange images with colleagues ("'I'll trade my pictures from Ethiopia with what you have on the Masai'"), the open source LionShare project, developed by Penn State University, has established a structure and mechanisms to enable legitimate peer-to-peer authenticated file exchanges among faculty worldwide.[6]

2.4 Licensed and Other Local Resources

Licensed resources were reported as "never" used by 52% of faculty (Figure 4). Our survey results and interviews reinforce the findings of those studies cited above about the lack of awareness and consequent underuse of expensively-produced digital resources on campus, especially those licensed from third parties. This puts the burden on individual colleges to publicize and demonstrate their digital resources and perhaps, as Penn State did with its Visual Image User Study, to research and describe faculty's actual needs and to match those needs to available resources. Resource providers increasingly realize they will never be the single, or even principal, source of digital images for any faculty, and they need to make their offerings as interoperable as possible with images from other sources.

Recommendation 4: Publicize and demonstrate locally-available digital image resources to faculty and, where possible, research faculty's most pressing digital image needs in order to match them with available resources.

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[4] Hawaiian for "quickly," a wiki is a server program that allows users to collaborate in creating a website's content and to easily add, remove, or otherwise edit the content.

[5] The NSDL considers direct recommendations for including a resource (http://recommend.nsdl.org/) and also works directly with lead organizations designated for a particular field. For example, the American Association for the Advancement of Science has its BiosciEdNet portal (http://www.biosciednet.org) for biological sciences.

[6] http://lionshare.its.psu.edu/

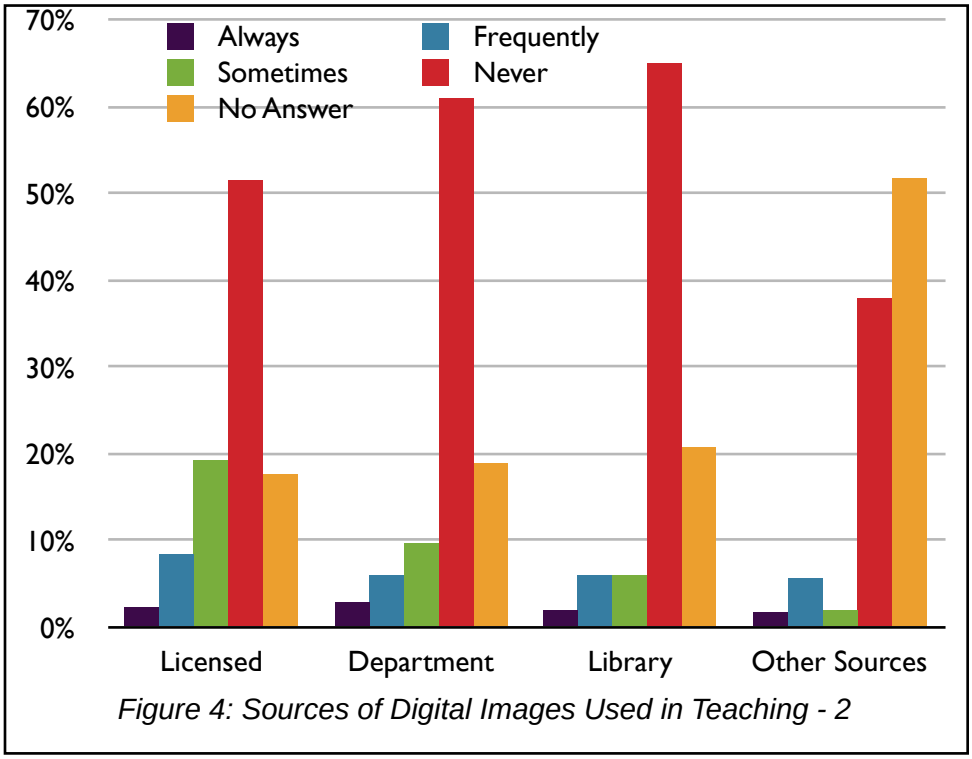

Figure 4: Sources of Digital Images Used in Teaching - 2

While 30% of faculty reported using licensed resources, only 19% used departmental and 14% used library digital image resources. In many cases, of course, these resources simply did not exist or they were still at an early and inchoate stage of formation.

Bringing together image collections from different departments (with their often quite different metadata schemas) into a single institutional collection is a difficult undertaking—and one whose complexity and expense, some visual curators felt, is not fully appreciated by central administrators.[7] We should also make note of the role of on-campus museums and special collections in providing digital images both for teaching and as an instrument to bring students into their physical collections.

Recommendation 5: In creating institutional collections serving many departments, recognize the jump in complexity beyond providing images and their necessary information for one discipline area.

2.5 Copyright

Copyright law issues are, of course, intrinsically connected to use of digital resources. None would declare copyright an easy subject, but it is apparent that, for a variety of

[7] For some approaches used at larger institutions, see presentations from the 2006 Visual Resources Association conference session "Cross Campus Collaborations in Building Digital Image Collections: Strategies, Challenges and Benefits." PowerPoint presentations available at http://www.colorado.edu/arts/vrc/vrc_2006vrac.html.

reasons, many visual resource curators and instructional technology departments have become somewhat risk-averse, shying away from exploring the possibilities for faculty to legally use copyrighted digital images in their classrooms and on closed course websites. Fair use seems particularly vulnerable on several campuses.[8] Creating an institutional copyright policy, with full community participation and expert copyright legal advice, is an important step. All campuses must be clear about legal responsibilities and the rights of intellectual property users.[9]

Recommendation 6: Locally, create a copyright policy with input from the entire campus community and copyright professionals. Educate the community about that policy and the principles behind it through a series of discussions with faculty, visual resources staff and instructional technology staff.

3. Image Use

A number of faculty in both the arts and sciences declared that using digital images had revolutionized their teaching. Overall, close to one-third said it had changed their teaching "very much" and another half "somewhat." The scientists registered the strongest response (40% in the physical sciences and 39% in life sciences said their teaching had changed "very much"), and faculty working in the visual arts also registered strongly (31% "very much" and 42%, "somewhat").

3.1 Digital Benefits

For students, the benefits of digital images are perceived by faculty to be their anytime/anyplace accessibility, the ease and convenience of that accessibility and their ability to make many subject areas more approachable and less intimidating. Overall for faculty, additional benefits include, in the words of one, the "vast variety of images from a variety of sources," giving teachers a new tool to explain concepts, as well as much greater flexibility and creativity in the classroom.

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[8]For fair use, see The Fair Use Network (http://fairusenetwork.org), created by the Brennan Center for Justice at NYU School of Law, and Stanford University's "Copyright and Fair Use" webpage at http://fairuse.stanford.edu/.

[9] For guidance on copyright policy creation, see the 2005 American Association of Universities white paper, *Campus Copyright Rights and Responsibilities: A Basic Guide to Policy Considerations* http://www.aau.edu/reports/Rights_and_Responsibilities_2005.pdf, as well as the meeting report, "Creating Policy: Copyright Policies in the University," organized by the National Initiative for a Networked Cultural Heritage at the University of Oregon in November 2001 http://www.ninch.org/copyright/2001/eugenereport.html.

For faculty teaching image-based subjects (art history and biology, for example), digital image collections can provide a greater abundance and variety of images than they have known before. Experimenting with digital features often leads to discoveries about new ways of teaching. Faculty teaching non-image-based subjects (languages, literature, physics, etc.) have new access to images; as a result, more of them are now using images for the first time or are using substantially more (often moving from using images as a "treat," or highlight, to incorporating them into the core substance of their teaching). This shift is clearly generating ideas about visual thinking and visual learning that are in turn changing approaches to teaching. In all subjects, the digital format can bring new relationships to images and to the material being studied. It also often brings an added enthusiasm to the class.

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3.2 New Image Use

The faculty in this study are using substantially *more* images, more frequently than they did analog images. They are also using them more flexibly, especially on-the-fly in the classroom when needed. Faculty are discovering how students can be better *engaged* with material through the use of digital images. New practices include the following:

- **Image Review:** Digital collections have transformed (with sometimes stunningly-improved results) the classic "image review" of required, core images undertaken by art history students. Limited access to slides on a slide table or photocopies posted on a bulletin board has given way to today's unlimited access to online images, often with self-testing routines. Another benefit is the the ability to post images online for student review for tests and exams.
- **Images on Course websites:** Whether for testing, assignments or general availability, two-thirds of faculty post images on a course website either directly or via course management systems.
- **Image Assignments:** Three-quarters use digital images for student assignments (while only a third use analog image assignments).
- **Image Presentations:** Increasingly, students are making multimedia presentations using digital images to report on their work.
- **Image Creativity:** Many faculty spoke of a new creativity accompanying the flexibility and abundance of digital images, manifested in their showing vary-

ing numbers of images in different combinations, in different relative sizes, and using animation, panning and zooming features.

- **Image Responsiveness in Class:** Related to this new creativity is excitement about being able to quickly call up and show an image in response to a student's question or a point made in discussion.
- **Images E-mailed:** Images are sometimes e-mailed to students by faculty in answer to questions or to clarify points.
- **Text-Image Relationship:** Faculty discussed radically different perceptions of the relationship between text and image (and the need to write things down) in the classroom with active image use.
- **Greater Interactivity:** Many reported that their use of digital images engenders much greater discussion and interactivity in the classroom; this was particularly noted by language teachers who use images in a variety of ways to stimulate discussion.
- **Improved Image Reading Skills:** A new attention is being paid to the skills needed to read, interpret and present images and there are often consequently higher expectations of students' visual abilities and responsibilities.
- **Student Images:** Students are increasingly required to gather, manipulate, present or create digital images (ranging from making molecular models or creating a professional portfolio of microscopy images to designing and producing magazine advertisements).

3.3 Benefits of the Analog Format

Although many maintain that the analog 35mm slide image is superior in quality to the digital image, this was often contested as digital projection facilities improve. However, most conceded there is still far less "technological anxiety" about using slide projectors than digital delivery systems. Unfamiliar equipment married to mostly-nascent institutional digital image databases paled against known slide projectors and well-catalogued, professionally-maintained slide libraries that art historians are used to. Unfortunately, these traditional services are being withdrawn in many cases as institutions close or restrict use of analog slide collections, sometimes without replacing them with adequate digital services.

Recommendation 7: Develop a plan, in consultation with faculty, to provide adequate digital image services when closing analog slide collections or restricting access to them.

4. Technology & Tools

Despite many criticisms of the state of digital projectors heard in the field, 60% of survey respondents said they were happy with the hardware used to present digital images in the classroom. This percentage is likely to grow as the technology improves and as the market for domestic digital image projectors expands (both of which will drastically reduce their cost). The presentation software used by 65% of faculty is PowerPoint; its universality and basic interoperability appeal to most. ARTstor (combining image database and presentation software) is making some headway, counting 12% of our survey respondents as users, although over half of them also use PowerPoint. Specialized image management and presentation software (Luna Insight, CONTENTdm and MDID) account altogether for only 5% of these users. Presentation tools that faculty want include: a sophisticated digital light-table; better (and easier) three-dimensional and zooming capabilities; ease of annotation; more on-the-fly capabilities to move through and display images from an image database in real time; and some way to automatically incorporate copyright considerations.

Recommendation 8: Work collectively to build and share easy-to-use, open-source tools to assist faculty to use and present images more fluently. Collectively publicize such new tools as they become available.

5. Support and Training: for Faculty and Students

5.1 Faculty Support

Almost all faculty (85%) receive some form of technical support—from multiple sources, though mostly from instructional technology staff. Support in digitizing, finding and managing images was reported as most important, followed by creating websites, copyright assistance and importing images into a database. In many instances, only a half or less report getting the assistance they need. As a result, there is much frustration, particularly about the amount of personal time consumed in going digital and the expectation that there should be more support available. This expense of time was cited by well over a third of respondents as their chief obstacle. The often excessive amount of time spent in preparing to use digital images is often the result of other impediments, chiefly a combined lack of adequate support, staffing, infrastructure and overall institutional planning for digitization. While many faculty praised individuals and often entire IT units, they also pointed to insufficient overall institutional support to give them the resources they felt were required to do the job. Several faculty felt

there was too much emphasis on basic training and little opportunity for more advanced classes. Help with finding or developing new tools is also needed.

Although hardware, software and classroom preparedness were cited as support deficiencies, a few also want more pedagogical support from instructional technology services, especially for ideas and assistance in how to use images most effectively. Fellow faculty are sometimes sources of great inspiration, and certainly some attempt at formal or informal gatherings to discuss pedagogy could be fruitful. However, the relationship between instructional technology staff and faculty should be a significant source of ideas.

One language teacher put in a call for a regional meeting of language teachers using images, to confer about current approaches and new strategies for the future.

Recommendation 9: Establish both campus-based and regional forums (within and also across disciplines) for pedagogical discussions and exchange of ideas and techniques among faculty about the use of digital images in the classroom.

Recommendation 10: Encourage formal and informal pedagogical exchanges between faculty and instructional technologists about ideas and techniques for using digital images more effectively in teaching.

5.2 Critical Literacies

Although some faculty need help learning how best to use digital images in the classroom, many are also finding that their students fail to grasp the skills needed to work with images. Students need help in three areas:

1) **Image Literacy:** analyzing or reading images, including maps;
2) **Digital Literacy:** handling and manipulating image files; and
3) **Image Composition:** creating and communicating through images.

Taken together, these represent what some are calling "critical literacies," others, "21st century literacies," which in the words of a New Media Consortium report consist of "the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively and to easily adapt them to new forms."[10]

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[10] New Media Consortium, "A Global Imperative: the Report of the 21st Century Literacies Summit," April 26-28, 2005, San Jose, CA. Available at http://www.nmc.net/pdf/Global_Imperative.pdf.

Regarding the first of these (image literacy), several faculty expressed exasperation at students who are not very observant (or not very interested in looking), who do not know how to describe what they see, nor how to connect a concept to an image or a map to a theoretical argument. While some students are looking more keenly, others need lessons on the importance of the visual, on how to look and how to use what they learn from looking.

The second issue concerns students' fluency with digital media. Students need to know how to consistently find, access, annotate, and share a digital image in multiple formats. They also need to develop a suite of portable and transferable digital skills.

Third is the area of visual communication, or having a grasp of what has been called visual rhetoric: the set of rules controlling how shapes and objects can be combined to communicate an idea. As Microsoft Word does not by itself make one a good writer, so Photoshop and Illustrator will not make one a visual communicator. For psychology professor and former animator Flip Phillips, this is an issue of "Design writ large" and could be addressed by classes in visual storytelling.

If they can, some faculty instruct in these areas themselves, although some are still debating what to do about it and who should do it: What should the faculty member do? When should instructional technology, or some other department, step up to the plate? When should an art historian teach Photoshop and Web Literacy and when should this be part of foundation "literacy" training? One art historian pointed out that it is more effective to inculcate 'digital curiosity' and the skills needed to satisfy it than to train students to develop facility with any particular software.

Some colleges are beginning to tackle this on a grander scale. Colgate University, for example, is considering making its "Developing Media Literacy" course required. St. Lawrence University has a "critical literacies" approach, teaching image, research, and technology skills at its Writing Center and offering "rhetoric and communications" training and support to faculty.

Recommendation 11: Locally, acknowledge the complexity of skills required by students to read, manipulate and create digital images as part of a larger body of skills needed to critically interact with today's media landscape. Consider the creation of a "critical literacies" training program for faculty and other staff and a foundation program for students that covers the areas of image literacy, digital literacy and image composition.

6. Institutional Infrastructure Issues

Perhaps the biggest challenge of all is that of institutional response: of managing change and of thinking strategically about planning the necessary infrastructure for effective use of digital resources. For practitioners, a common frustration appeared to be either that of insufficient institutional buy-in or a college's difficulty in appreciating the cross-institutional implications of creating digital image resources and the production and presentation facilities required to work satisfactorily with the new medium.

Often issues were taken one at a time, without understanding how they were connected. Changing responsibilities and roles for visual resources collections, the library and the instructional technology group—and changing relations between these bodies—complicate the situation on many campuses. Decisions are sometimes made at the highest level without recognizing, as one visual resource staff-member put it, "how much of a sea change this whole issue is and how much it means in absolutely affecting every level of the institution." Empowering and funding cross-department, cross-functional groups (including faculty) to make coordinated, informed decisions is one good way to lay the right foundations. Some schools have found that dedicated imaging centers can highlight issues, focus decisions and bring disparate parts of the campus together around the benefits that coordinated digital image production and delivery can bring.

"Decision-makers should recognize how much of a sea change this whole issue is and how much it means in absolutely affecting every level of the institution."

Finally, it might serve us well to recognize the complexity, difficulty and expense of deploying digital images and to regard the transition to using them as a longer, more ongoing process than we have expected up until now: a transition that will need careful managing. As Smith College art historian Dana Leibsohn put it: "This notion of transition is interesting—but it has a really long tail and we have to think harder about it and what it means to be in transition for more like fifteen or twenty years, rather than the five to eight years we've been talking about. National initiatives will help; peer exchange will help—but I think we're not thinking about transition as seriously as we should as an ongoing process."