

VIUS Reports 2.2

Analysis of General Surveys

Analysis has revealed a number of interesting trends and patterns. These include looking at how faculty and students compare in current and projected image use, differences in how faculty use digital versus analog images, how ownership and size of a personal image collection is associated with image use and attitudes, how faculty comfort levels with technology are associated with image use, graduate versus undergraduate student use of images, preferences for searching, and the use of images by disciplinary groups.

Some Faculty and Student Comparisons

Users. A greater percentage of faculty currently use images more than students (75.4% versus 55%) for their academic work. However, of those who currently do not use images, a higher percentage of students (46%) expect to start using images in the next three years as compared to faculty (36%). Of course, since the number of students in the target disciplines (approximately 21,150 in the list we sampled) is much greater than the number of faculty in those disciplines (2,134), student picture-users outnumber faculty picture users by more than 72 to 1.

Images used. Faculty use an average of 9.4 times more images per typical semester than students. Faculty use an average of 552 analog images and 526 digital images per semester versus averages of 34 analog and 56 digital images for students. However, a few faculty are extremely intense image users and skew the averages. Median image use between faculty and students is much closer together. Faculty use a median of 33 analog images and 30 digital images per semester versus 10 analog and 15 digital for students.

Uses. It terms of activities associated with images, faculty place more importance on presentations and creating sequences than students. Only 36.4% and 38.1% of students indicated that image presentations and saving sequences for presentation were very important while 63.2% and 52.5% of the faculty indicated likewise. Students placed more importance on the technical aspects. Students indicated that the following were at least somewhat important: creating image maps (37.5%), posting images on a web site (58.3), and putting images on CD-ROMs (70.3%). Faculty responded 15.2%, 44%, and 41.2% respectively. Students were more likely to consider obtaining images from the web as being at least somewhat important than faculty (82.0% versus 44.0%).

Purposes. Most faculty use pictures more often for teaching than for other purposes. When asked how they used images, more faculty indicated that they use images for teaching (66.9%) than for research (52%), outreach (40.9%), and other professional activities (38.9%). Additionally, faculty use a greater median number of images per semester for teaching (50), than for research (20), outreach (5), and other professional activities (5). Students use images both in lower numbers and more equally divided between the options they were presented. Students indicated that: 44.3% used a median of 10 images per semester for class projects; 45.8% used a median of 5 images for independent research projects; and, 44.5% used a median of 5 images for other educational purposes.

Public Collections. Looking only at those who indicated that they use images, roughly similar percentages of faculty (25.5%) and students (34.3%) indicated that they have used images managed by a department, center, museum, library (not including the pictures in books or magazines), or other university service. When looking at the specific library image database services, similar percentages of faculty and students among those who use images have used the AMICO™ art images database (2.6% and 2.9% respectively) and AP Multimedia Archives™ database (5.7% and 6.3%).

Individual Collections. Both faculty and students indicated that they maintain a personal collection of images for academic/professional use. Surprisingly, a nearly equal proportion of students (23.5% of respondents and 44% of picture users) indicated they maintained a collection as did faculty (32.2% of respondents and 44.2% of picture users). However, the median size of the faculty's collection was ten times larger. Faculty median collection size is 500 images versus 50 for students.

Some Faculty and Student Expectations

Going Digital. Faculty and students agree that they'll tend to increase their use of digital images more than they will analog images. Survey responses suggest that only 25.2% of faculty and 33.3% of students at least "somewhat agree" that they will increase their use of analog images while 75.1% and 75.2% respectively say that they will increase their use of digital images. They further share a definite, but not overwhelming, preference for digital images in terms of ease of use, functionality, and organization. For both faculty and students, the majority of responses for these ease of use and organization items lie nearly equally divided between "neutral", "somewhat agree", and "agree strongly."

A Delivery System. A nearly identical percentage of faculty (76.8%) and students (79.2%) at least "somewhat agree" that a centralized image delivery system will be useful to them.

System Benefits. In terms of the most useful aspects of a system, both faculty and students placed "access to a larger number of images" and "reducing my labor" in the #1 and #2 spots on a list with 11 options. Further, both groups placed "presentation tools", "reduce travel," and "reduce storage space" very low. Faculty were somewhat more likely to appreciate the feature of "copyrights and permissions sorted out for me" (#3) than students (#6).

System Pitfalls. In terms of greatest areas of doubt about the prototype, the 2 groups both placed "content of images" as the number one concern on a list with 12 options. Both groups also placed high doubts on just being able to use the system from both a technical and knowledge standpoint. "Other technical problems" was #2 on the faculty list and #3 on the students' list and, right up there, were concerns about the system being "hard to learn" (faculty #2 and students #4). Mirroring the section of the survey about searching, the students were more concerned (#2) about "search terms" than the faculty (#5). These results suggest that users are mainly looking for a simple way to receive the content they need. Complicating details are generally not desired and will likely play into fears about technical problems and the system being hard to learn. The concern about the digital image delivery system being unnecessary due to an abundance of readily accessible images ranked the lowest concern on the students' list and the second lowest concern on the faculty list.

Faculty: Choice of Media and Purpose of Use

Have many faculty "gone digital"? Will they use digital images for teaching or research purposes? These are the focus of the next portion of this analysis. As it turns out, there appears to be a pattern associated with teaching, research, analog, and digital use. Based on current practice, teaching is more highly associated with analog images while research is more highly associated with digital images.

Current Media. On average, 44% of all images used by faculty who responded to the survey are digital images. However, the average hides an underlying split. It turns out that of the 649 faculty who currently use images, 185 (30%) use only analog images and 113 (18%) use only digital images. In other words, nearly half of the respondents fell at the very extreme edges of this spectrum. The other half were scattered evenly throughout.

Expected Purposes. In terms of predicting demands placed by faculty on a potential digital image delivery system, it is possible to look at how the image users predicted a system would help the most. The result is the following breakdown for teaching, research, outreach, and no expected help.

Figure 1. Predicting Demands Placed by Faculty on a Potential Digital Image Delivery System.

Teaching	81.5%
Research	22.4%
Outreach	15.6%
No Help	5.5%

Teaching emerges as the dominant projected use of the system with nearly four times the number than the second ranked projected use of research.

Current Purposes. We can also take a look at correlating the use of digital and analog images to each other and to the number of images used for different purposes of teaching, research, outreach and other. This gives us the following table of Pearson's correlations which can let us see different patterns of usage. All image use values were per semester and non-users were excluded. Respondents were not asked in the survey to indicate what ratio of analog to digital pictures they used for teaching, research, and outreach so this is our best way at estimating this.

Figure 2. Correlation Table¹

	Digital Use	Teaching	Research	Outreach
Analog	0.16	0.88	0.25	0.15
Digital		0.38	0.45	0.23
Teaching			0.22	NS
Research				0.07*

All $p < 0.001$. Except *: $p = 0.065$, NS=Not significant

The extremely high correlation between teaching and analog image use stands out. This correlation is much higher than between teaching and digital image use. This suggests faculty who use images for teaching are using more analog images. Conversely, there is a stronger correlation between digital image use and research than between analog and research. Faculty using images for research will tend to use digital images more often than analog images. The fairly low correlations between Analog and Digital image use and between Teaching and Research use is interesting as well. In other words, knowledge of one cannot be used to predict the other since they are fairly independent.

Mismatch. Most faculty members expect to use a digital image delivery system for teaching. In terms of current image usage, faculty who use images for teaching are far more likely to use analog images while those who use images for research are more likely to use digital images. Faculty expectations do not match their current image usage. The vast majority of the faculty (81.5%) have indicated that they would mainly use the system for teaching. However, they also reveal that they strongly tend to use analog images for teaching. Conversely, researchers, who already tend to use digital images, make up a minority (22.4%) of the potential users of a digital image delivery system. This is puzzling news. Possible explanations for both of this mismatch include anything from an existing demand for services that are being unmet, uninformed or unrealistic expectations, or some sort of survey-generated bias. If the mismatch is real, it could suggest unrealistic expectations, which would pose a problem for any digital image delivery system we devise. On the other hand, behaviors may change and the survey data suggests that more faculty believe they will be using more digital images in the future than analog

¹ The full sample includes 2 outliers. One uses an unusually large amount of digital images per semester (10,000) and the other uses an unusually large number of analog images per semester (5,000). If you remove just these 2 subjects out of 633 you get a noticeable amount of change in the results. The general trends are the same but the results were exaggerated when including these 2 users, so this table represents a conservative estimation by removing those 2 outliers.

images. So, perhaps this mismatch represents an opportunity to meet newly forming needs that are not currently being met. More research is required in this area to clarify this issue.

Faculty With Personal Collections

It would not be unreasonable to expect that those faculty members who indicated that they maintained a personal image collection would, in fact, use more images per semester. This turns out to be true for both analog and digital images as indicated below.

Figure 3. Analog Use Per Semester by Ownership of Personal Collection

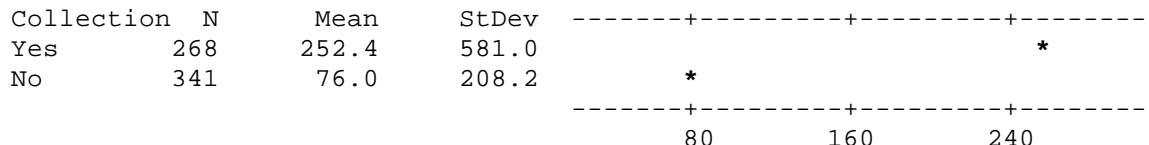
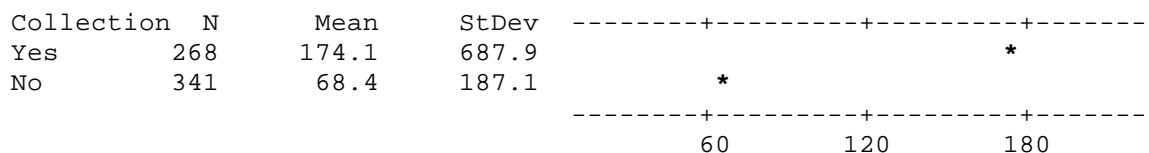


Figure 4. Digital Use Per Semester by Ownership of Personal Collection



The survey did not ask faculty to indicate the analog/digital make up of their collections nor their purposes but we can still draw some conclusions. The table below shows the Pearson's correlations between the size of personal image collections and the different types and uses of images. Those with larger collections are more likely to be using more images for teaching and using more analog images (one follows the other due to the aforementioned positive correlation between analog and teaching). There was not nearly as large a correlation between personal collection size and research use or digital image use. This suggests that personal collections are more typically used for teaching and mainly comprised of analog images.

Figure 5. Correlations between Personal Image Collections and Different Types and Uses of Images.

	Personal Collection Size
Teaching use	0.57
Research use	0.17
Outreach use	0.22
Analog use	0.59
Digital use	0.23

All $p < 0.001$

Regression analysis supports this and suggests that for every analog image used in a semester a faculty member will have nearly six images in his collection while for every digital image used he will have just slightly more than one in his collection. Of course, this does not mean they will only use images from their personal collection but this demonstrates how the numbers and types of images actually used per semester relate to the number and types of images that reside in their personal collection. It is also a group-wide average and will vary from individual to individual.

Faculty With Large Collections

Those faculty with large collections have been examined more carefully in hopes that their habits would suggest successful approaches to system development. To this end, the following section looks at how the responses of faculty members with large collections differ from faculty with small collections. Thirty-two percent (N=270) of the faculty who responded said that they maintain a personal collection of images. For this analysis, "Large" refers to respondents with large image collections (analog and digital) that fall in the top quartile (>2000 images) and "small" refers to those with image collections in the bottom quarter (<163). "Medium", when used, refers to those in between.

Heavy Users. Not surprisingly, those with larger image collections also tend to use more images (both analog and digital) per semester. While not surprising it is a nice verification of our data.

Figure 6. Analog Images Used Per Semester by Personal Collection Size

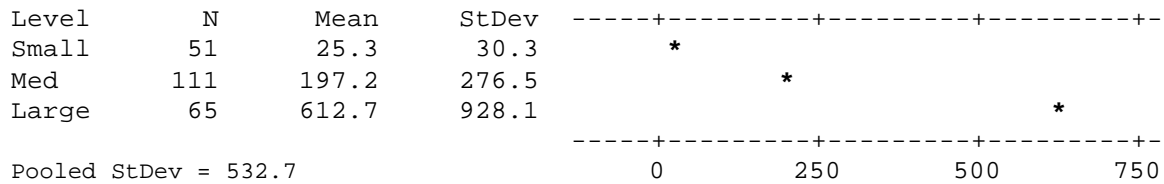
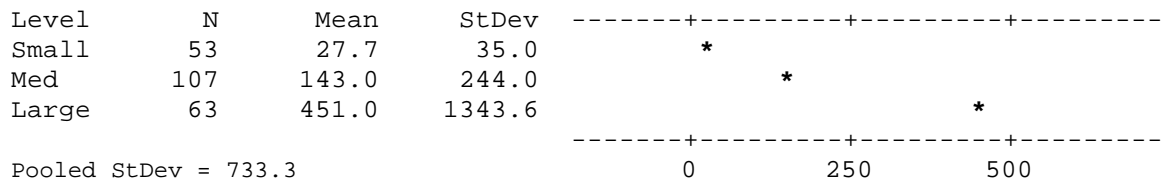
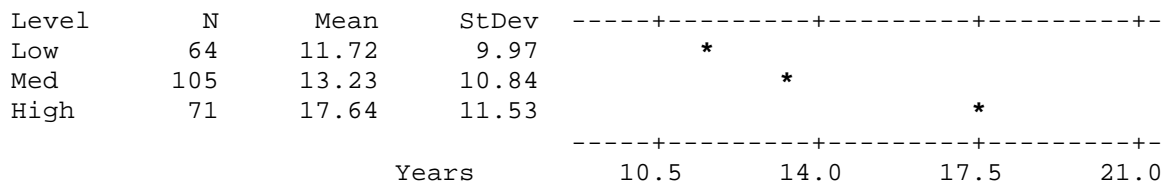


Figure 7. Digital Images Used Per Semester by Personal Collection Size



Experienced. It takes a while to build up a large collection! Those with larger collections tend to have been faculty members for a longer time.

Figure 8. Years of Service by Personal Collection Size



However, the standard deviations are large compared to the means which shows that there is a wide spread in the years of service related to any given size collection.

Highly Concerned. The responses of faculty with large collections tended to place greater importance on a number of matters than faculty with small collections. Usually the medium group mirrored the large group. The large collection group holds more importance on:

- group viewing
- storing sequences
- scanning
- illustrating papers, etc.
- searching by place names or geographic coordinates
- searching by chronological categories

They also tended to be more concerned about an insufficient supply of pictures sources and concerned that their searching methods might not match the way a collection is organized.²

Tolerant. Those with large collections are slightly less likely to express concern the system being “hard to learn”. They are also more concerned about images being “insufficiently documented (identified, dated, etc.)”. In both cases, large collection owners seem to accept that more work may be required, perhaps even work that they must undertake themselves.

Figure 9. Concern That System May Be Too Hard to Learn

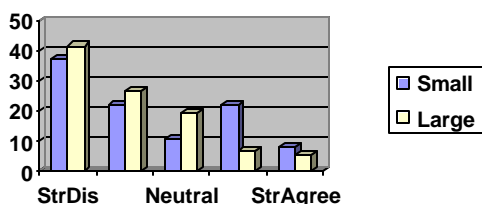
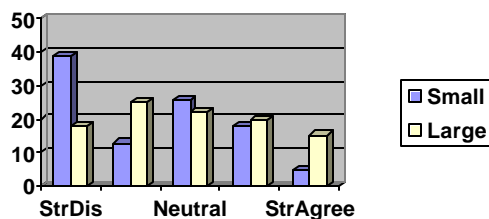


Figure 10. Concern About Lack of Documentation of Images



In all graphs, the Y-axis indicates the percent responding in the fashion indicated on the X-axis.

Users of Public Collections. The two graphs below are very interesting when taken together. First, the graphs show that when going outside their own personal collections, those with large collections are much more likely to acquire images from a public (departmental, museum, library, etc.) collection than from the AP Multimedia Archive. This is logical since the AP database is just one collection versus the many potentially represented on the other graph. Nonetheless, large collections owners are twice as likely to use a departmental, museum, or library collection. On the AP Multimedia graph, none of the “large” owners acquired images from that source and only 7.35% of the “small” owners did. So, in general, those with large collections tend to go outside of their collections more often but they specifically are not visiting AP Photos.

Figure 11. Acquired Images from AP Photos

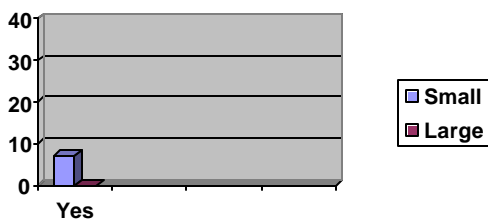
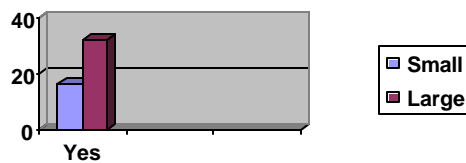


Figure 12. Have Used a Departmental, Museum, Library Collection



² Each of these group attitudes has a slightly different character. These are detailed by individual graphs in Appendix IV, Additional Survey Data on Faculty with Collections.

Faculty: Comfort With Technology Inside & Outside the Classroom

The table below is a matrix showing how faculty responded for the items relating to their comfort levels inside and outside the classroom. The good news is that 55% were at least somewhat comfortable with using technology both inside and outside the classroom. Looking at the 45% that were neutral or uncomfortable in at least one, 34.5% were more comfortable using technology outside the classroom than inside, 8% were equally neutral or uncomfortable at both, and only 2.6% were more comfortable using technology inside the classroom than outside. Chi-square analysis shows that there is a statistically significant tendency to be less comfortable at using technology inside the classroom than outside ($p < 0.001$).

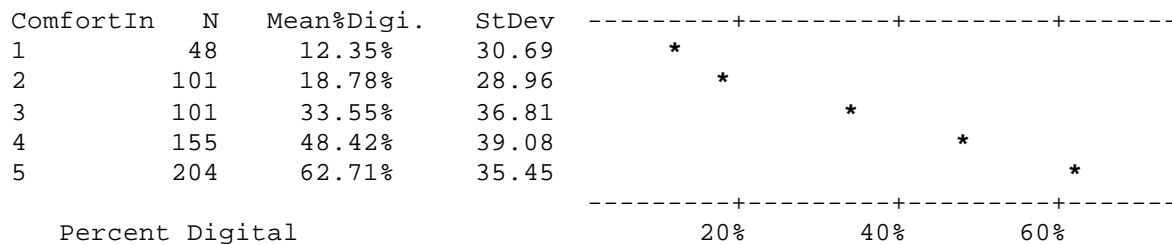
Figure 13. Faculty Response to Technology Relating to their Comfort Levels Inside and Outside the Classroom.

	Inside: Somewhat Uncomfortable or less	Inside: Neutral	Inside: At Least Somewhat Comfortable
Outside: Somewhat Uncomfortable or Less	5.2%	0.7%	0.4%
Outside: Neutral	3.6%	2.8%	1.5%
Outside: At Least Somewhat Comfortable	16.7%	14.2%	55.0%

N=719

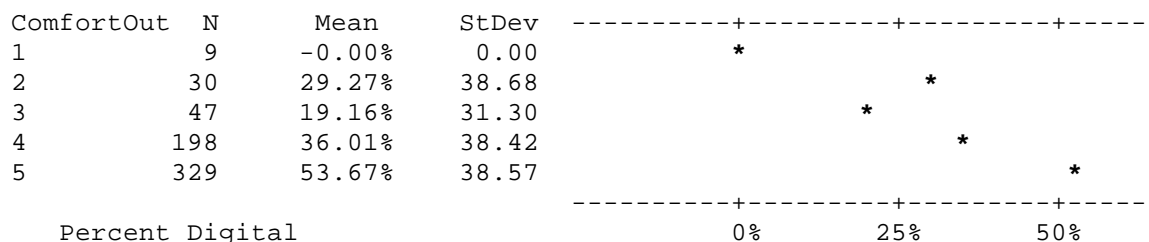
Comfort and Quantity. Comfort with technology inside and outside of the classroom is closely related to the number and types of images that each faculty member uses through out the course of a semester. The graphs below suggest that this is true. This first graph relates comfort with using technology inside the classroom (comfort levels 1-5 with 5 being the most comfortable) to the percentage of digital images used out of all images used (i.e. zero percent equals all analog to 100% equals all digital). It is quite apparent, and not surprising, that those most comfortable using technology in the classroom use a much larger percentage of digital images (62.7%) than those least comfortable (12.4%).

Figure 14. Comfort Level Using Technology Inside the Classroom and Percent Digital Images



A similar, but not quite as crystal clear result, appears when looking at comfort with technology outside the classroom. This is not surprising since it appears this system would be targeting teaching (inside classroom) use more. However, the trend still holds and is statistically significant for comfort outside the classroom. Instead of having 5 discrete groups as in the above example we end up with a low group, three groups in the middle, and a high group. In fact, those 9 members of the lowest group did not use one digital image between them. As an aside, there are more people uncomfortable with using technology inside the classroom than outside the classroom—more on this in the next section.

Figure 15. Comfort Level Using Technology Outside the Classroom and Percent Digital Images



Conversely, one might expect that those who are less comfortable with using technology would perhaps use more analog images. The two charts below bear this out. The difference here is that it is really only those in the very least comfortable category (comfort level=1) where this is most noticeable. Otherwise the different comfort levels are fairly equalized in terms of analog image use--although those who are most comfortable (comfort level=5) with technology do use the least number of analog images. So some people who are very comfortable with technology in the classroom are using analog images, at least some of the time.

Figure 16. Comfort Level Using Technology In the Classroom and Number of Analog Images Used

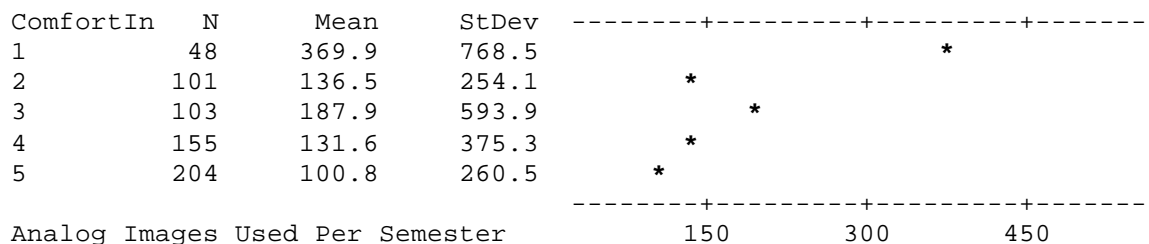
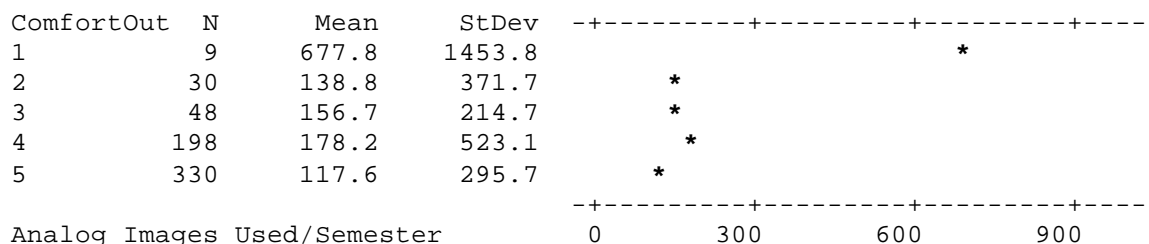


Figure 17. Comfort Level Using Technology Outside the Classroom and Number of Analog Images Used



The more comfortable faculty members are with using technology inside and outside of the classroom the more digital images they use. Additionally, those members of the faculty who are the most uncomfortable with using technology use the most analog images. While it is clear that the comfort levels of using technology both inside and outside of the classroom are related to the number and type of images used per semester it is not possible to determine causality. We cannot determine through statistics whether their comfort level directly determines the type of images (digital or analog) that they will use or whether their use of digital images may cause them to become more technologically comfortable as they acquire the necessary knowledge. Perhaps it is a little of each and there are likely other factors involved as well. Consider the following:

- technology comfort levels are associated with the use of digital images (more comfort, more digital)
- faculty are less comfortable using technology in the classroom than elsewhere
- teaching uses are the primary expectation for digital images
- faculty expect to be using more digital images

Combined, this points to a conflict between comfort and expectations -- expectations are apparently for increased discomfort. This could well be due to lack of knowledge about the new media.

Students: Graduate Versus Undergraduate

Graduate and undergraduate students have different patterns using, search for, and collecting images. “Scholars”, who are undergraduate honor students, are interesting to include because they fluctuate between more closely matching graduates or undergraduates. Graduates and undergraduates use equal numbers of digital images per semester but graduates use significantly more analog images. Grads and undergrads use equal number of images in the classroom but grads use far more images outside of the classroom. Both groups are equally as likely to use an external image collection but, at least among the respondents, more undergrads used the online AP Multimedia and AMICO image databases. Graduate students are more skeptical about search features in general. Graduates are twice as likely to maintain a personal image collection than undergrads but the size of those collections are not significantly larger. Both groups are equally comfortable using technology. Graduate students tended to be more extreme in their responses while undergrads remained more neutral. Some of these generalizations are assured by statistical significance. Others can only be descriptive of the survey’s respondents. The following tables detail these findings.

Quantity. Graduates tend to use a statistically significant greater number of analog images per semester than undergraduates. However, for digital images, the difference does not reach statistical significance and we should consider their use of digital images as being equivalent. Scholars more closely match undergraduate students in the quantity of analog images used.

Figure 18. Quantity of Images Used by Graduates and Undergraduates

	Graduate	Undergraduate	Scholars
Analog per Semester (p=0.043)	53.5	27.0	21.2
Digital per Semester (not sig.)	72.9	45.9	70.0

Purposes. Graduates and Undergraduates tend use images differently in different settings. The two groups are nearly equal in the number of images used “for class assignments” per semester. However, graduates will use nearly 3.5 times as many images per semester “independent research projects” and twice the number “for other educational purposes.” In short, graduate image use really takes off outside of the classroom.

Figure 19. Use of Images between Graduates and Undergraduates.

	Graduate	Undergraduate	Scholars
Class Assignments	34.0	38.0	31.0
Independent Research*	64.8	18.7	45.5
Other Educational Use**	38.5	19.9	10.5

*Significant difference p=0.01

**Significant difference p=0.05

When asked if their “use of images [is] primarily creative (with the goal of making original works)”, undergrads were more likely to respond affirmatively. The difference approached statistical significance.

Figure 20. Use of Images for a Primarily Creative Purpose.

	Graduate	Undergraduate	Scholars
Yes	37.2	51.8	43.3
No	62.8	48.2	56.7

($p=0.062$)

Students and Public Collections. When asked whether they have used a public (departmental, museum, library, etc.) collection of pictures, approximately one-third of both graduates and undergraduates replied that they had. When looking specifically at the AMICO and AP Multimedia image databases, the usage is too low for any statistical tests for determining a significant difference in usage patterns between graduates and undergrads. Of our actual respondents, a greater percentage of undergraduates used both of these databases than graduates. Since it is not possible to conduct any statistical testing we cannot say that this reflects the student population as a whole but only those responding to the survey.

Figure 21. Percentage of Students Using AMICO and AP Multimedia

	Amico	AP Multimedia
Graduate	0.0%	3.2%
Undergraduate	4.3%	7.2%

Student's Personal Collections. Graduate students are far more likely to maintain a personal image collection for educational purposes than are undergraduate students.

Figure 22. Percent of of Students with Personal Image Collections.

	Percent Who Maintain a Personal Collection
Graduate	66.0%
Undergraduate	37.3%

Significant difference $p<0.000$

While graduates are much more likely to maintain a personal collection the size of those collections are not significantly different than the size of the collections maintained by the undergrads. The graduates in our sample did have collections that were on average 160 images larger than the undergraduates. Due to the large variances this did not reach statistical significance. This means that we cannot be sure whether this applies beyond our sample to the student population as a whole (i.e. the observed results could be due to random chance rather than a systematic difference between the two groups).

Figure 23. Average number of Images in Personal Collections

	Average # of Images in Personal Collection (standard deviation in parentheses)
Graduate	431 (1013)
Undergraduate	273 (675)

Comfort With Technology. The response patterns to the questions about their comfort with technology was nearly identical between graduates and undergraduates.

Faculty and System Features

There is no survey evidence that faculty are looking for exotic features in an image delivery system. A number of different lines of evidence suggest that they are likely to respond better to an easy-to-use system oriented towards simply providing images.

Comfort. A big issue that impacts the desirability of different system features is the faculty's technological comfort and knowledge level. While 86.8% were at least somewhat comfortable with using technology outside the classroom only 58.4% were at least somewhat comfortable using technology within the classroom. Most faculty think that the necessary hardware is available in classrooms (only 20% disagree with the statement "Classrooms with hardware for projecting digital images are available") so it appears that this is not chiefly a hardware availability issue. As discussed previously, faculty comfort with technology use in the classroom was associated with digital image use in the classroom. Along the same lines, concerns about the image delivery system being "hard to use" was the third-ranked concern among a listing of 12 concerns.

Expanding upon the theme of ease of use, while about 75.4% of all faculty use images in a typical semester they do not want a lot of work associated with using images. Only 32.2% maintain their own collection, 19.0% go to the trouble of visiting an outside physical collection and only 4.2% will use the online resources of AMICO and/or AP Photos. Similarly, "Reducing my labor in gathering and managing images" was one of the second ranked benefit (out of 11) of a digital image delivery system. Most faculty image users can probably be described as casual users who will not find it worthwhile to have a lot of extra work associated with their image use. They are not likely to want to take the time to learn a new system that looks complex and cannot be used in conjunction with the software that they are already familiar with. Clearly, an image delivery system should strive to be easy to learn and complement the use of software that users are already familiar with rather than presenting new learning challenges.

Integrated Presentation Tools. Initially, project members expected that integrated presentation tools would be a highly desired feature of the digital image delivery system. Faculty survey data suggests that this is not necessarily the case and these findings were partly confirmed by focus groups discussions. The availability of presentation tools incorporated directly in the system managed to rank only 9th in a listing of 11 possible benefits of the image delivery system. This is despite the fact that in a list of 14 possible uses of images "Showing analog or digital images for group viewing" and "Arranging analog or digital images into sequences for presentation" ranked number 1 and 2 among faculty respectively. What does this apparent conflict mean? Possibly it indicates that their current needs for presentations are currently being met by another software package (such as Power Point, etc.) and that an image delivery system with built in presentation tools (such as Luna's Insight) would not be valued. A more in depth look into this issue was conducted during the faculty focus groups and detailed in those reports. The prototype system could be a simple image retrieval system where the user perhaps needs to use 3rd party software to edit and present the images. Or, it could be a system that combines image retrieval, manipulation, and presentation in one package. In light of the overwhelming desire for a simple to use system where extra features are not desired, the first approach seems to be warranted. Why spend the time and resources on features that will not be valued and, in fact, may discourage some people from using the system?

The simpler route also plays into other user attitudes. Survey data suggests that there is a lower comfort level associated with using technology in the classroom than outside the classroom (perhaps the limited range of use of the software makes the time spent learning it not worthwhile in comparison to learning software with a greater range of use such as Power Point). Additionally, data from the focus groups suggest that current presentation needs are being met by existing 3rd party software. This implies skills and acceptance in using them. It makes sense to follow where both their comfort and current usage lies. In other words, they can use their own existing 3rd party software for editing and presenting images rather than building it into the prototype and forcing them to learn new skills.

Therefore, it is recommended that the prototype system focus first and foremost on being a simple and effective means for finding and retrieving images and forgoing the more complex features such as presentation tools. Content was the number one concern the faculty had regarding the system and an effective database is a necessary step to delivering the content that they are looking for. In short, the system should simply and effectively provide the users with the images they seek and from that point the users can fully integrate these images with whatever existing methods and programs they use for their other images. This maximizes their comfort and use of existing skills and knowledge.

Faculty and Student Searching

Faculty who currently use or expect to use images did not place much importance in searching methods. Eight methods of searching were listed in the survey and respondents were asked to indicate how important each method was. Only one item, “by name of item depicted or theme”, was ranked above neutral importance by the majority of faculty (56.2%). The remaining 7 search types all ranked at about one-third or less of the respondents placing them at above neutral. The two more exotic search functions of “visual similarity” and “formal characteristics” received the lowest percentage of faculty ranking it above neutral importance (18.6% and 16.1% respectively). Students were more likely to indicate that various search features were important. Three items were ranked above neutral by students, with “by name of item depicted or theme” taking tops honors at 76.8 percent. Below are several investigations into how different users value search features.

Faculty Searching and Purpose. Teaching and research oriented faculty value search features differently. The table below shows statistically significant differences ($p < 0.05$) in perceived importance of different search features when comparing “teaching users” to “non-teaching users” and “research users” to “non-research users” This is not a direct comparison between teaching and research users since there is some overlap (among those that use both) but that overlap is only 7% of the users. A plus sign in the chart indicates that users in that group will value that search feature more than users not in that group. To see how each search feature was precisely described please refer to the original survey questions (question 8 on the faculty survey and 9 on the student survey). Search features not listed had no significant differences between user groups.

Figure 24. Perceived Importance of Search Features between Teachers, Researchers, and Outreach Users.

	Place or Geographic	Chronological Category	Creator	Media	Name of Thing	Not Predetermined
Teaching Users			+	+	+	
Research Users	+	+	+	+		
Outreach Users		+ *				+

$p < 0.05$, except for *, where $p = 0.071$

Students and Searching. There is an interesting, inverted tendency for how graduates and undergraduates answered the Lickert scale questions. This general pattern must be considered in student responses to specific questions. Undergraduates tended to respond in a more typical bell-curve shaped fashion that was centered around “neutral.” Conversely, graduates often answered in a U-shaped curve meaning that they tended to have stronger opinions (less neutral) with more respondents answering towards the extremes. For instance, while the majority (more than 80%) of both grads and undergrads agree at least somewhat that group viewing is an important use for images, grads will have relatively fewer neutral and more extreme responses than undergrads who will be somewhat more in the middle. While there were definitely different response patterns between grads and undergrads, it is often not

possible to say that one group leaned a certain way more strongly than the other for any given item. Cases where grads and undergrads essentially agree but exhibit the more extreme versus neutral pattern includes the importance of group viewing, searching by place, searching by chronological order, and searching by creator. We often can conclude only that grads had stronger opinions in both directions simultaneously while undergrads tended to be more neutral. Perhaps this general pattern suggests that graduates have simply had more time and exposure to develop stronger opinions.

However, there are cases where graduates and undergraduates have come to different conclusions about the importance of certain search features. In the table below, a plus (+) indicates that group has a significantly greater appreciation for that search feature while a minus (-) indicates a significantly lower appreciation for that feature. Clearly, the graduates are more skeptical about a number of search features. In this aspect, graduate students more closely mirror faculty members as discussed below. Searching by creator is interesting since while that previous pattern (extremes vs neutral) applies it is tipped in the disagreement direction for graduates (more strong disagreement than strong agreement) but is tipped in the agreement direction for undergrads (more moderate agreement than moderate disagreement).

Figure 25. The Importance of Search Features between Graduates and Undergraduates.

	Media	Visual Similarity	Formal Characteristics	Not Predetermined
Graduate	-	-	-	-
Undergraduate	+	+	+	+

Priorities for Search Types

There are some similarities in the way students and faculty rank search types. However, an important disclaimer is needed here. This is a good example where a significant statistical difference does not equate to a real-world difference. Our large sample sizes allow us to determine that for faculty there is a statistically significant difference ($p < 0.05$) between the importance placed on certain search features. For example, if we compare searching “place or geographic coordinates” with “formal characteristics”, users really do prefer “place” that little bit more). However, in the real world, the 0.2 difference is not useful in helping design the system. For the most part, this does not help us decide between features since they are all so close. It is interesting, however, to note that the faculty’s and students’ lists are nearly in identical order -- even though the faculty are less enthusiastic about any given search feature.

For each table, scale 1=Not Important, 3=Neutral, 5=Very Important

Figure 26. Faculty’s Average Ranking of the Importance of Search Features

Name	3.4
Media	2.9
Creator	2.6
Not Predetermined	2.6
Chronological	2.5
Visual Similarity	2.2
Place or Geographic	2.2
Formal Characteristics	2.0

Figure 27. All Students' Average Ranking of the Importance of Search Features

Name	4.1
Media	3.7
Creator	3.5
Not Predetermined	3.4
Visual Similarity	3.2
Chronological	3.1
Place or Geographic	3.1
Formal Characteristics	3.0

Figure 28. Undergraduate vs Graduate Ranking

	Undergrad	Grad
Name	4.2	3.9
Media	3.9	3.5
Creator	3.7	3.2
Not Predetermined	3.5	3.1
Visual Similarity	3.4	3.0
Formal Characteristics	3.2	2.8
Chronological	3.2	3.1
Place or Geographic	3.1	3.2

On the lower ranked items, undergrads and grads ranked items slightly differently. Again, these items are all so close that there is no useful difference between them.

Figure 29. Inclusive Ranking of Search Features between Students and Faculty.

Search Feature	Faculty	Graduate	Undergraduate
Name	1	1	1
Media	2	2	2
Creator	3	3	3
Not Predetermined	4	5	4
Chronological	5	6	7
Visual Similarity	6	7	5
Place or Geographic	7	4	8
Formal Characteristics	8	8	6

Faculty Image Use by Discipline

The results below represent an initial look at how image use varies by discipline. Analyzing the data by discipline has proven difficult, primarily because of variations in department names, variations in position titles, the quality of address lists, etc.) which will require more work to overcome. A better picture of use-by-disciplines should be available in the final report. Nonetheless, some of the numbers that are immediately available can be used to get a picture of the potential audience for an interdisciplinary image database service. For the analysis below, only faculty at the main University Park campus were included. Based on the departmental affiliation of those faculty members, five disciplinary categories were constructed that correspond roughly to five colleges at University Park: Agriculture, Arts and Architecture, Communication, Earth and Mineral Sciences, and Liberal Arts. Generally these comparisons suggest that there many faculty in most disciplines use images, but that faculty in some disciplines use many.

Quantity. When we consider the number of images (analog and digital) used per semester, it may not be a surprise that the arts and architecture group ranks first.

Figure 30. Analog Images Used Per Semester by Faculty

	N	Mean	StDev
Arts & Architecture	67	420.1	642.6
Earth & Mineral Sciences	45	233.5	725.2
Liberal Arts	111	162.2	519.2
Agriculture	108	130.6	215.7
Communications	11	51.8	60.6

(Statistically Significant p=0.003)

Number of People. When we consider the disciplinary breakdown as the number of people who currently use pictures, the results may be a bit more surprising. A larger percentage of the agriculture and the earth and mineral sciences faculties are picture users than arts and architecture faculty.

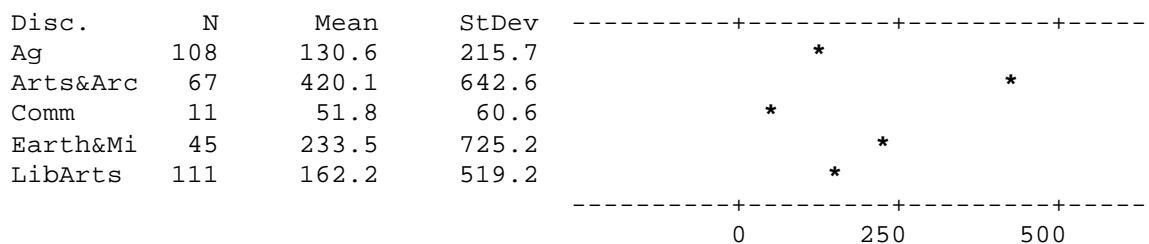
Figure 31. Faculty Who Use Pictures (Headcount)

	N	%
Earth & Mineral Sciences	59	96.6%
Agriculture	155	91.6%
Arts & Architecture	92	80.4%
Liberal Arts	197	65.6%
Communications	23	56.5%
Overall		76.9%

Bear in mind that the “arts and architecture” group includes the disciplines of music and theatre. But even if the raw numbers are considered, rather than percentages, the number of picture users in the agriculture and earth and mineral sciences faculties are much larger than those in the arts.

Other Quantities. The following more detailed tables show that the number of images used for teaching and outreach varied significantly by discipline. Arts and architecture used the largest number of images for teaching while agriculture used the most for outreach. There was no significant difference between disciplines for the number of images used for research.

Figure 32. Number of Analog Images Used Per Semester by Discipline



Statistically Significant p=0.003

While the number of analog images varied significantly by discipline as illustrated above, the same was not true of digital images.

Figure 33. Number of Images Used for Teaching Per Semester by Discipline

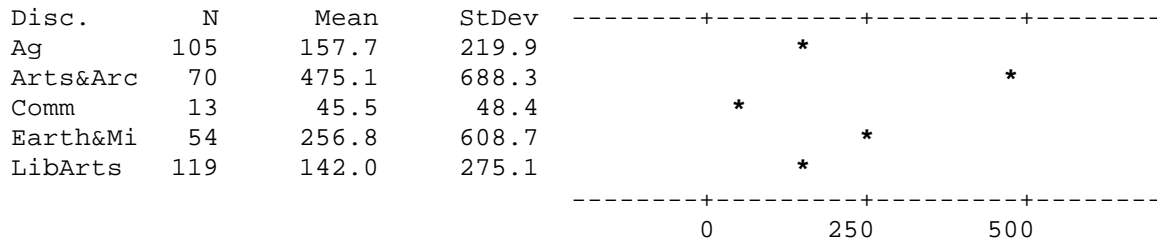
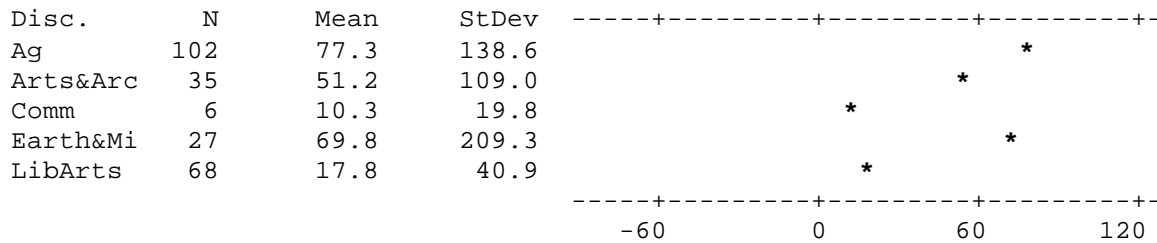


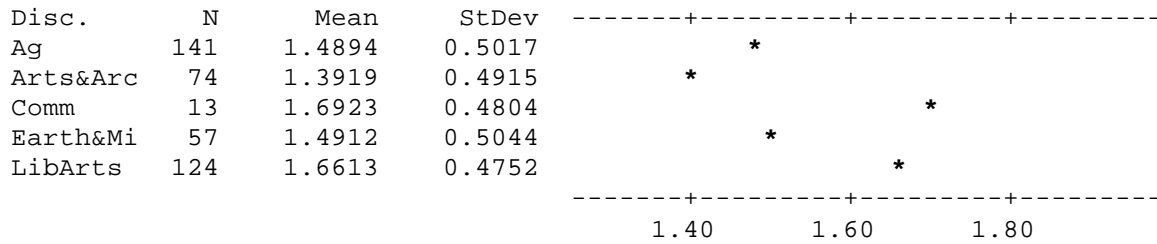
Figure 34. Number of images used for Outreach per semester by Discipline



Art and Architecture faculty were more likely to maintain their own personal collection of images than faculty in other disciplines. Communication faculty were least likely.

Figure 35. Maintenance of Personal Collection by Discipline

1=Yes, 2=No, Mean equals average of all respondents in the category

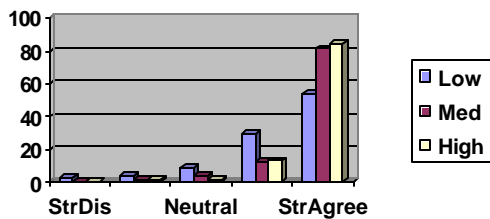


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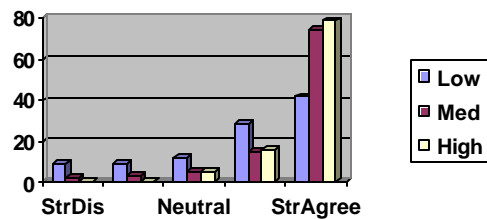
Supplementary Survey Data on Faculty with Collections

In the analysis of the broad faculty survey, faculty with large collections have been examined more carefully in hopes that their habits would suggest successful approaches to system development. Thirty-two percent (N=270) of the faculty who responded said that they maintain a personal collection of images. For the following graphs, “Large” refers to respondents with large image collections (analog and digital) that fall in the top quartile (>2000 images) and “small” refers to those with image collections in the bottom quarter (<163). “Medium”, when used, refers to those in between. In all graphs, the Y-axis indicates the percent responding in the fashion indicated on the X-axis.

Importance of Group View by Personal Collection Size

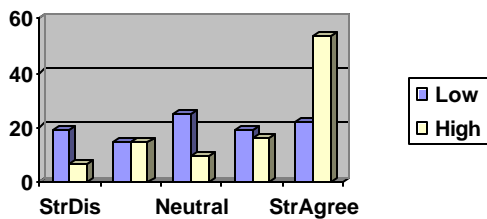


Importance of Saving Sequences by Personal Collection Size

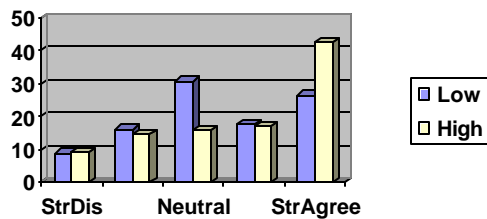


The two graphs above are an example of the “Med” group mirroring the “High” group. While all groups thought *group viewing* and *saving sequences* were important, not surprisingly, the “High” group thought they were more important than the “Low” group. Those in the “High” group were approximately twice as likely as those in the “Low” group to indicate that they “Strongly Agree” that these group presentation items were important.

Importance of Scanning by Personal Collection Size

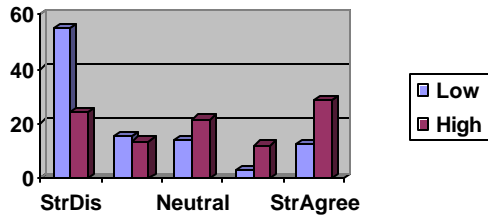


Importance of Illustration by Collection Size

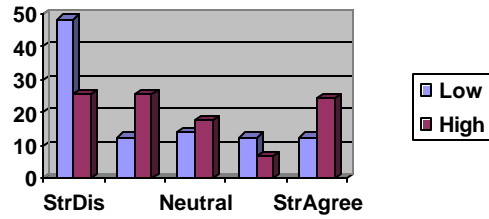


These examples continue the trend. Those in the “High” group tended to have a greater appreciation for the different tasks and functions related to image use.

Importance of Searching by Geographic Coordinates

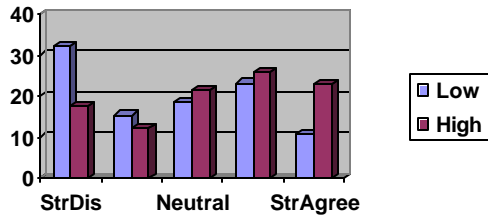


Importance of Search by Chronologic

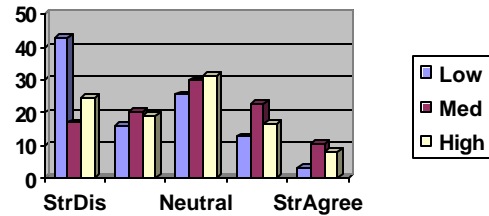


In general, as illustrated by the two graphs above, those with small image collections tend to be less concerned by the search methods while those with larger collections are fairly equally scattered across the board. Similar graphs could be produced for the other search features such as creator, name, and media. The exception to this are the more exotic search features of searching by image similarity, formal characteristics, and non-predetermined characteristics where there are no big differences between the "Low" and "High" groups.

Agreement that there are Too Few images available



Concern that User Search Terms Not Match System's



The two graphs above come from the "concerns" section of the survey. As with the features section, owners of small collections tend to be less concerned than owners of larger collections.

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 April, 2002
 Rev. May, 2002