The Next Generation of Academics

A Report on a Study Conducted at the University of Rochester

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Executive Summary

This document reports on the user research portion of “Enhancing Repositories for the Next Generation of Academics” (IMLS Grant No. LG-06-06-0051). We conducted user research from December 2006 through March 2008 to support development of a suite of authoring tools to be integrated into an institutional repository. Our understanding of the work practices of graduate students enabled us to design the authoring tools to meet their needs for individual and collaborative writing and to make it easy for them to move completed documents from the authoring system into the repository.*

Over the past five years, the University of Rochester’s River Campus Libraries have engaged in extensive user-centered design processes to support the scholarly work of students and faculty. Having studied faculty and undergraduates, we wanted to take a closer look at our graduate students to see how we could improve the Libraries’ support of their work. To this end, we interviewed 25 students, eight each

* We thank the Institute for Museum and Library Services for enabling our projects through their generous support.
from the humanities and social sciences, and nine from physical sciences in order to learn about their work practices.

In general, we found that the graduate students we interviewed, whom we believe to be representative of graduate students at our institution, are keenly aware of their relative inexperience and the limits to their knowledge of the disciplines and literatures into which they are becoming initiated. Many of them are intensely focused on their goals of completing the dissertation and finding academic jobs. They push themselves to share their work, for example by presenting and publishing papers, often under the direction of their dissertation supervisors. Many of them join dissertation writing groups for both mutual moral support and intellectual assistance.

Perhaps the greatest challenge to graduate students is the extensive literature they must master to formulate novel projects and substantiate their arguments. Much of this reading comes in electronic form, mainly as PDF files of journal articles but also as online books and reports. Graduate students are directed to much of the literature by their professors and supervisors. However, they also seek resources independently through databases, online journal sites, Google, and the online library catalog.

Reading, annotating, organizing, storing, and later citing and marshaling evidence from both paper and electronic documents requires that graduate students develop competence in a range of technologies. These include such traditional, paper-based technologies as marking books and printouts and developing systems for filing them in drawers or bins in ways that make them findable in the future. They also include such digital technologies as bibliographic software, removable storage (for example, flash drives), tools for full-text searching of computer drives, and so on.

All the students we interviewed struggle to achieve proficiency in both traditional and digital technologies. We did not interview a single student who had settled into a satisfactory routine in either. Graduate students change their work processes over the course of their projects and most complain that they have not found adequate ways to organize information and retrieve it later on. We found enormous variety in the way they approach these and other tasks, including communication with peers and advisors.

Graduate students fear computer failure, although this does not propel them to adequate protections, such as backups. Graduate students tend to learn technologies – whether traditional or digital – either alone or from peers, as opposed to from manuals or from experts. Only a small fraction of interviewees reported learning technologies in a classroom setting. Several reported learning special applications from their advisors, although they also reported teaching technologies to their advisors.

In sum, the graduate students we interviewed navigate large bodies of literature using any tools they can find to the best of their abilities, often risking technology failure or experiencing the limits of their proficiency and knowledge. Sometimes they turn to each other for help but rarely do they seek help from library professionals, preferring to rely on themselves or on whatever help their supervisors give them. Their work-related needs are many, offering the library a range of opportunities to help, if we can offer that help in such a way that they will see its value and accept it.
I. Introduction

This document reports on the user research portion of “Enhancing Repositories for the Next Generation of Academics” (IMLS Grant No. LG-06-06-0051). We conducted user research from December 2006 through March 2008 to support development of a suite of authoring tools to be integrated into an institutional repository. Our understanding of the work practices of graduate students enabled us to design the authoring tools to meet their needs for individual and collaborative writing and to make it easy for them to move completed documents from the authoring system into the repository.

This report summarizes the overarching study, describes our methods, reviews the findings, and presents a number of applications, some already completed or in progress.

Over the past five years, the University of Rochester’s River Campus Libraries have engaged in extensive user-centered design processes to support the scholarly work of students and faculty members. For example, in separate studies, library staff members have been aided by an anthropologist to aside their assumptions about how students and faculty approach research and writing, observing them instead in situ as they moved from source selection through information gathering to the crafting of a finished written work. Data gathered from these two studies informed the enhancement of an institutional repository (IR) and the construction of a collaborative learning space.

Having studied faculty and undergraduates, we wanted to take a closer look at our graduate students to see how we could improve the Libraries’ support of their work. In particular, we saw this as an opportunity to build on our previous study of the faculty’s use of institutional repositories. Graduate students seemed perfectly suited to this study because they are currently working on their dissertations and are poised to become the faculty members and researchers of the future.

Our first IMLS study posed the question: How do faculty members generate, find and use grey literature? We realized that our DSpace-based repository was underutilized and we investigated as a possible cause its lack of features to support the ways faculty members approach the production of their own digitally created work and seek the grey literature of other scholars. The results of our work-practice study pointed to several enhancements, including personal showcase pages for faculty members and researchers, download statistics, and a checksum tool to support long-term preservation of files. We added these features to our IR and observed an increase in repository use as a result, but it was not a dramatic increase.

The present project, “Enhancing Repositories for the Next Generation of Academics,” is our second IMLS-supported study (IMLS Grant No. LG-02-03-0129-03). Our goal in this study has been to make the repository even better at helping faculty members and researchers collect, preserve, catalog, and disseminate their work. To do this, we needed to add to the features we developed after the faculty study. Specifically, we wanted to build an authoring environment on our IR platform, while also integrating traditional and digital library functions and services. The end product is to be one interface for a wide range of research, writing, and archiving activities.
We interviewed 25 students, eight each from the humanities and social sciences, and nine from physical sciences, in order to learn about their work practices. By creating an authoring environment that supports these work practices, we hope to help graduate students:

- Integrate authoring with finding and publishing tools
- Share their work online with colleagues and faculty advisors
- Allow for their completed dissertations to be moved seamlessly from the authoring environment to the IR
- Enhance the findability of their documents through the creation of metadata during the writing process
- Find greater readership for their dissertations

Further, we hope that librarians will take on a mentoring role as library experts for graduate students and that faculty will use the virtual library environment to review and comment on student work. We also hope that faculty advisors will follow their students’ example and make better use of the authoring tool and the IR for their work.

The project’s core team included the three principle investigators, a project social scientist, a software engineer, and the collection developer of the institutional repository. The project team included the core team plus five librarians and library staff, a graphic designer, and the systems administrator assigned to the IR. The core team took responsibility for the overall direction and running of the project. The project team conducted the interviews under the guidance of social scientists¹, collaborated in the design process, and acted as a testing team for the tools built by the developers. A team of usability testers also provided expert help to the project.

Both the River Campus Libraries and the University administration have supported the IR movement by committing funds to hardware and infrastructure costs. Additionally, the University of Rochester now requires that doctoral candidates file electronic dissertations in the repository, joining nearly 200 institutions that already do so. There is strong interest within the academic and library communities in grey literature produced by graduate students and the University of Rochester continues to make significant contributions to the IR movement in the form of research, development, publications, and open-source code. The results of our current project lend a strong voice to the dialog on the importance and the challenges of preserving and disseminating grey literature.

¹ Interviews were conducted by Dr. Dolores Byrnes and Dr. C. Todd White.
II. Methods

Our primary research method was a work-practice study on selected graduate students and their faculty advisors. Our development method was participatory design.

Work-practice study is the fine-grained, in situ examination of the actual practices engaged in by people at work. Specifically, our study used video recording and interviewing techniques in offices, libraries, and other sites to document and analyze real activities as graduate students and faculty advisors performed actual work related to the completion of doctoral dissertations.

Participatory design is an iterative process used widely to design, develop, and improve services, objects, code, and physical spaces. It involves a wide range of stakeholders in all stages of research, design, development, and implementation. In our project, students, faculty members, librarians, a graphic designer, software engineer, and an anthropologist met to review data and propose solutions to the requirements that the data reveal. While experts drafted solutions that met the identified requirements, all stakeholders participated in testing and refining those draft solutions.

Work-practice study differs from usability studies and surveys in its fine-grained, onsite observation and documentation of people engaged in real time in their normal, everyday practices. In the discovery phase, we used a modified work-practice study to learn how graduate students do their work on a day-to-day basis.

Our modified work-practice study involved videotaping the work process of graduate students in such settings as library carrels, laboratories, home offices, and campus offices. We also conducted group analytical and brainstorming sessions to develop a list of requirements. The list of requirements specified what students must be able to do with web-based tools that support their work on their dissertations, and what problems must be solved in relation to their tool use. This list of requirements provided the informational basis for proposing solutions that address needs and problems.

As we analyzed and interpreted the data, we identified the most promising solutions and tested them against the requirements in order to be sure that we built a system that responded directly to needs that emerged from raw data. We wanted to keep the connection between our observations of actual graduate student and advisor behavior, on the one hand, and the needs that we abstracted from those observed behaviors, so we searched our raw data anew to double-check our inferences. We then proceeded to base our system specifications on those documented needs.

III. Detailed Findings

In the following sections we review A) some of our insights about our graduate students and, B) the technological implications of those insights. Each insight or implication is followed by one or more quotations from graduate student interviews. Graduate students are identified by a three-part code. The first part, “GS” identifies them as graduate students. The second part is an abbreviation for their areas of study, according to the following key:
The third part is an identifying number that is used when we interviewed more than one graduate student in any particular area. For example, GS-Engl-04 is the fourth graduate student we interviewed in the English Department.

A. Insights about graduate student behavior

We analyzed the interview data through a lengthy manual process of reading and coding the transcripts. We then interpreted the data to draw out a number of observations of graduate student work practices. The following statements describe only the students who participated in our study. We believe that these students represent graduate students in general at the University of Rochester in the year 2007, but we do not claim that they represent graduate students elsewhere or at other times.

1. Graduate students are acutely aware of their inexperience as emergent scholars.

1.a. Graduate students worry about their inexperience, doubting themselves, their work practices, and the quality of their work. This is a normal and understandable yet not fully acknowledged component of their growth as scholars. This growth requires the transition from being an undergraduate to becoming a robust, full-fledged scholar. Regardless of their individual starting points or their final goals, all graduate students acutely feel their limited knowledge of their fields. They are also highly aware of the importance of finding and acquainting themselves with both the people and the literature that will help them become more expert in their fields. One of the most pertinent aspects of this need for knowledge of their field is the need for doctoral candidates to work on worthwhile research questions. They cannot afford to spend time and effort re-inventing the wheel.

GS-Engl-04--: I guess what I mean by “writer’s block” is just feeling intimidated, or feeling like “this is too big,” “how can I write 300 pages,” “where do I start,” “what do I read,” “how do I get into this?” And then feeling that inferiority complex that graduate students and probably professors usually feel, like “I’m an intellectual impostor,” all of these little… demons in your head.
1.b. Traditional technologies, from the Socratic Method, to reading works on paper and annotating them by hand, to face-to-face discussion are as important as ever within academia and have been augmented by digital technologies rather than supplanted by them. Graduate students still need to learn traditional technologies as well as newer digital ones.

*GS-Psych-01*: I love reading articles, I love doing the background research. I'm not as good at organizing it, like so when I go to my advisor, she wants it to be organized. Whereas I’m just like “This is the coolest finding, isn’t it?” “Well, what’s the next question?” I’m not as good at that.

1.c. Because of their anxieties, graduate students seek the counsel of their peers.

*GS-Engl-04*: Actually, the dissertation group that I’m in has been really helpful for [dealing with “writer’s block” or intellectual “inferiority complex”]. Not only because I’ve been having people encouraging me consistently with my own writing, but because I can see them writing, too. And I can see that they also struggle with the same things, and I can use what they do as a model, or like, “Oh, that's a good strategy!”

1.d. Graduate students also create professional relationships with peers outside the University of Rochester, and use these contacts in their own professional growth.

*GS-VCS-02*: I belong to two [dissertation] groups, basically, one in Rochester and one in Toronto. The one in Rochester is […] two other students who are in [my program]. And in Toronto […] it’s three people from […] York, and an artist and a curator. And two people from this program who are living in Toronto. […] And then I also send it to one of my friends that I went to college with who’s at, she’s in California. She’s also in graduate school […]. I send it to a lot of people!

2. As part of their growth as academics, graduate students present and publish papers.

*GS-Psych-02*: I have, my Masters is in press, and I’m second author on that paper with my advisor. I’m hoping to finish this one. There’s a paper from when I was an undergrad that we’ve been throwing back and forth for like seven years or something, that may get submitted at some point in time. And then I’m like fourth author on another chapter that some people at the hospital were doing.

3. Graduate students reach beyond their “comfort zones” to share their work.

3.a. Despite their anxieties, graduate students share their work, their resources, and their questions with colleagues in their fields. They also collaborate, for example on journal articles and edited volumes.

*GS-VCS-03*: I [have a forthcoming publication in an anthology which came out of a conference.] [...] The person who was very instrumental in organizing the conference had the idea of publishing the book, and he contacted me and wanted me to be the coeditor.
3.b. This sharing often entails the use of digital technologies.

**GS-Opt-01--**: We have a big collaboration with some other universities, so we will have teleconferencing, like, every week. So basically, every... I think about every five weeks, we need to prepare for some kind of presentation to show our results. [...] We use Microsoft PowerPoint. We use that. [...] We call to some number, and then we put our presentation file onto some server and we can control the flow of the presentation, something like that. It's kind of high-tech.

4. One of the central anxieties for graduate students is the enormous amount of literature they must master to become competent in their fields.

4.a. This reading involves books, which are much more central in the humanities than in other areas.

**GS-Engl-04--**: I actually had to buy another bookshelf in my house because I had so many ILL and library books at one point. They were all over the floor. And now I probably need another bookshelf... but anyway. [laughs]

**GS-Engl-03--**: I had left these two shelves open for the books that I’m checking out to do my work, so these – it’s just getting kind of shoved in full of library books. And there’s some here and there’s some elsewhere. They’re just sort of piling up.

4.b. This reading universally involves journal articles, which most graduate students download as PDF documents from online sources.

**GS-Psych-04--**: In my documents folder, I have a folder for articles [...sort of one folder, the one major folder, and then forty-one other folders inside of that main folder. [...] On this computer I have at least 1,000 [PDFs], if not more, I’m sure.

**GS-Biol-01--**: I have over 200 papers in my office and I have, you know, read the papers, highlighted them [...].

**GS-ElecEng-02--**: These [folders on a shared server] are references from all the papers I can get, because in the paper we need a reference. And I would use or save a document like: the author’s name, the paper’s name, and the paper’s source, like the conference name, and the year.

5. Graduate students could benefit from the use of digital technologies such as EndNote or RefWorks, but most perceive the barriers to entry as too high.

5.a. Perceived barriers include: the time to learn the technology and become comfortable with interfaces that are not user-friendly, the time to convert files that are in another system, the risk of new
technology being constantly upgraded and requiring constant new learning, and the concern that if one does not use the technology often enough to retain it, s/he will have to relearn it repeatedly.

**GS-VCS-01**: [T]he question is “did I note the citation?”… When I’m doing online work I use EndNote, and I’m a big EndNote fan. I download when possible, except I’ve got interface issues. I think some of the means of downloading that stuff is complicated and difficult. But I figured it out, I’m pretty savvy on the computer. Um, but I think there are real issues about… I think there needs to be huge improvement about being able to download that stuff, citations, easily.

**GS-Engl-03**: I have tried to use RefWorks and I find it even harder to work with than MLA. Like I don’t even know how to use it, and partly that’s my fault. I have been trying to figure it out from the documents online instead of asking someone who can show me how to do it. But I can download these text files, but I can’t upload them into RefWorks in an order that makes sense to me. But I kind of wish I need to look into using that as a tool because I think I there is, I collect a lot of stuff and I dump it and that’s eventually going to become a problem but at this stage it’s not one yet, so I think what I would end up doing is retype this citation information.

**GS-Engl-02**: Right now I am just too busy to do the extra effort to get used to a new system.

**GS-BCS-01**: I’ve never used EndNote or anything like that. Been tempted to learn it but I don’t know, just haven’t had a good opportunity.

5.b. Because of these concerns, many students use simple – if time consuming – alternatives.

**GS-VCS-03**: I don’t [use EndNote or RefWorks] – since these are not part of my original bibliography, I kind of mark them, what I’ve used. I take notes, you know in a notebook, and then later on if I’m going to use citations from them, I go to my notebook and I know where to look for the citation. […] I always wish that I myself were a more organized person, so I could use all of the computer’s capabilities. I don’t, because I kind of settle into the most comfortable habits. I wish I were more um, curious, to find out all I have at my disposal, but I don’t do these things because there’s always something coming up that I need to get it done as fast as I can.

5.c. These perceived barriers are so high that some students even seem to exhibit a sort of “tech phobia,” or at the very least, a distinct aversion to taking the time to learn the digital technologies available to them.

**GS-Edu-01**: I tried to learn how to use… End – note? Absolutely impossible. I can’t, you know. And there’s even a free service, is it the free one through the library? [No, RefWorks. - interviewer] RefWorks! I can’t. You know, it’s just – so, I’ve always done my citations by hand.

6. Graduate students use a variety of digital technologies.

6.a. Graduate students use digital technologies when the technologies address core needs and have visible benefits. These benefits are often immediate.
6. Students may also adopt digital technologies in expectation of future critical needs.

GS-PoliSci-01: That’s a big part of why I use LaTeX. I do like – although it’s a pain, I like in the end how it handles citations and things. And for technical work it’s somewhat of a standard now. So it’s also, to be honest, just a signal to the job market that you are up on things and so if you know LaTeX then you can do tech work basically.

7. Graduate students must simultaneously become proficient in traditional and digital technologies.

7.a. For a variety of reasons, graduate students want and need to be proficient in both digital and legacy technologies.

GS-Econ-01: For these kinds of [seminar] presentations [...] I am not allowed to use PowerPoint nor even a slide; I have to write everything on the white board. [...] My advisor says we have to; it is because it is like giving a class, and so I am telling them a paper but giving a class on that. [However, my professors use PowerPoint] in fact most of the presentations that they are going to do for seminars outside the university and even like the seminars with all the professors they do use PowerPoint or at least the slides, but in the classes they don’t.

GS-Engl-02: I have actually done – with the old-fashioned concordances, by hand – I have actually done a lot of work with that. There was an essay I wrote a few years ago [...]; actually it was sort of a preparation essay for my prospectus. [...] I do, do the old-fashioned paper concordances. I am sure now with computers being, you can churn those out in a matter of minutes which take German philologists twenty years to compile them. I am sure it will probably be a lot more accurate now, too.

7.b. Graduate students – including those who are proficient and heavy users of digital technologies – exhibit an almost universal preference for paper, one of the most traditional academic technologies. This is due to its many affordances, which include its ease of annotation, its portability, its visibility, and the relative comfort it provides compared to the eyestrain induced by extended periods of reading on a computer screen.

GS-Psych-05: I like to have the hardcopy, I can’t—it’s nice to carry something around and not always have to go back to my computer. Or if I want to write some comments on it I can do that, I am sure I could find a way to do that with PDF versions but it’s just easier for me to have a hands-on version.

GS-Engl-03: Even if [resources] are available as PDF they just come here [to my computer] and they just find a nest and, you know, they don’t get looked at [onscreen].
You know, they get looked at printed on paper sitting on the desk or if I can carry them to the coffee shop or... if I can take them, I like the portability!

**GS-PoliSci-01**: I personally have to have in the hand, at least for the articles that I am going to cite my work, because they get marked up all over the place and um... you know sometimes I... [laughs]. And I still print single sided for articles, otherwise by the time I merge everything up I can’t read anything... um... so a lot of my colleagues read them on computers but I just do it this way, and when referring to them I have piles of articles strewn around here on the floor and I just need something to grab them.

**GS-BCS-02**: I usually will print the whole paper [and write summary or commentary notes at the top in pen]. Yes, that’s why my filing cabinet is almost completely full. I like things, I mean, I cannot, I don’t like reading on a computer, so I print everything.

7.c. The universal practice of annotation on paper means that library copies, while heartily appreciated and used extensively, are not always seen by graduate students as the ideal way to engage with a source. Many students eventually buy their own copies of key texts for their work, or else go to lengths to avoid writing annotations in library copies even as they keep them checked out for extended periods of time.

**GS-VCS-03**: When I get library books, I don’t underline the library books. So I kind of take notes, or put markers, little Post-Its in the sections that I want to go back to. [But] I just destroy my own books. There are more marginalia in a lot of my books than there is text on that page.

**GS-Engl-03**: I accumulate [PDFs of articles] in this way and there is a way in which the, when it’s this kind of an electronic format it’s very... I remember paper. If I touch it I remember it. If I read it in a class I remember it. So I have a hard time keeping things in my head when they are in this format. [...] I mean I would have everything on my paper, although it’s not good for the environment. But I would have everything on paper, it would be my preference. But in the absence of that... [So yes, I would prefer to own my own copy compared to using the library’s], because I feel guilty and then I avoid writing even in pencil but there is a way in which I can’t remember unless I [annotate].

**GS-Engl-05**: [When I find an article] I print it out, and some things I have [physical paper] files for. [...]I highlight a lot, I write a lot, books that I don’t want to highlight and I use Post-Its. Library books I generally don’t mark at all. I just keep them for a really long time and rely on knowing exactly which chapter is relevant to me, so library books take a lot of memory!

7.d. Those who do make marks in library copies often feel uncomfortable with that practice, and might subsequently type up the portions of the book that they need to retain in a document on their computers.
**GS-VCS-01--**: You know, my working process is, for example, in the books that I’ve just been working on, I’ve gone through, I’ve done readings and I flag something of importance or that’s interesting. I write in books far too much – the librarians hate me. But I’ll make a little comment or use a stick it. Always in pencil, you know, go through the book and comment. And then, on second or third read, I then type in the quotes that are really useful.

7.e. Another aspect of graduate students’ preference for paper is the fact that most print out drafts of their own work in order to edit their writing on paper rather than onscreen.

**GS-VCS-01--**: One of the most important steps in my writing is printing it out and editing what I’ve got on the paper. And drawing little arrows: “okay, that’s got to move there,” “that’s got to do that,” “that argument has to develop.”

**GS-Engl-02**: For real editorial revising and on my own work, I really need to have the physical object in front of me.

**GS-Engl-01--**: I prefer to comment on my own work with pens, rather than using the commenting function [in MS Word] most of the time.

**GS-BCS-02--**: [I write it] on the computer, but I keep printing it out and I can’t make changes on the computer, I print out every time I write it out, and make changes on there and throw away drafts.

8. **When it comes to digital technologies, many graduate students prefer to learn on their own or from a friend.**

8.a. Students may learn how to use new technologies from an advisor or a peer, or they may simply figure things out on their own.

**GS-Psych-02--**: [My advisor] taught me. She was great about -- her method of teaching us often is that we sit next to her, so like she’ll do stuff and I just do a lot of watching. And then I sort of pick up, I have a lot of motor memory for things like that. I’ll see it and then know how to do it.

**GS-Econ-01--**: [When I learned LaTeX] someone gave me another program of another paper that he was doing so he gave me that so then I only had to do a few things. It is kind of a very logical program, so if you want to start a section what you do is say “section,” so it is very easy to get a new command and I had a book also that I was just looking every time I had a problem, and [the] Internet.

**GS-Phys-02--**: Uh, yeah, right, [I did learn LabVIEW from the people in my lab]! You take something that someone else has done and you just try to figure out how it works, and then in the process of figuring out how it works, you figure out ways to make it do what you want it to do now.
9. The graduate students in our study employ a wide variety of work processes, changing the process over the course of a project.

9.a. Many graduate students make outlines for their written work of dissertation chapters, conference papers, or journal articles. Interestingly, they rarely follow this outline closely, although they find the outlining process useful itself. They seem either to allow their work to deviate greatly from the outline, or they treat it not as much as a sequential mental itinerary as a project map within which they can skip around.

**GS-VCS-03**: After I [brainstorm with] cluster [diagrams], I always make outlines. I start doing roman numerals, and numbers, and letters – I do an outline on the chapter.[....] And I try to work out the outline, but what usually happens with all this, is that when I start with the introduction or one of the sections, it kind of finds a life of its own, and it goes somewhere totally different. So yes, I start with an outline, which is a great mnemonic help. [...] But once I start working, I never – almost, I’ve never in my life – followed that outline.

**GS-Psych-05**: I will try and make an outline for myself just because I need to organize my thoughts some. But oftentimes once I have that outline I will just take a chunk and work on that for a bit.

**GS-Psych-01**: I’ve discovered I’m a really good editor, if someone gives me something to read I’m very good at figuring out what could make it better, but I have a really hard time going from scratch, I mean next to impossible [...so] a lot of times I’ll start with an outline, that makes things a lot easier for me because then there is at least something for me to work from as opposed to this blank sheet of paper.

9.b. Graduate students do not necessarily begin drafting papers or the dissertation itself from the beginning or even in an otherwise orderly manner.

**GS-Engl-04**: So I pick a point, a little arbitrarily, and then I just start writing about it. And then I see where I can go on from there. So it’s sort of like your little niche or your foothold or your window in, to like get you from the blank page to create forks on it. [So], no, [I don’t write from the beginning], not really, necessarily.

**GS-Engl-05**: Technically I have started since June but finally I am making real progress, doing a lot of scattered writing which hasn’t been really productive. So finally last few weeks it’s making a little bit of progress. [...] One of the reasons I was really stuck is because I was trying to do it one chapter at a time. But apparently that’s not the way I think.

9.c. Graduate students utilize other scholars’ bibliographies as a highly useful research strategy, particularly for finding sources on emerging scholarly topics that have yet to be coherently categorized in their discipline’s major research indexes or tools.
GS-Engl-03--: I don’t find MLA very useful but I don’t know what else to use. I don’t find it a very... I mean at this point my best sources of research are other bibliographies because, for example, there is a ton written on [specific topic] narratives. But if you type in “[specific topic] narratives,” you get six sources. That’s all.

GS-Engl-02 ---: A lot of the best articles I have found have been looking at the bibliographies of other articles or other books that I thought were really interesting.

GS-Phys-02--: If you find something that’s close to what you’re doing, typically [...] it’ll show the references and so you can print out the paper and read through the references and then, typically a lot of them are directly attainable just by clicking on the link here [...] It’s really fast now; you can really cover a lot of ground pretty quickly.

GS-BioEng-01--: I will usually start from one interesting paper, and I read the paper, and find the reference list at the end of the paper, and then go ahead and find a bunch of them; so it’s like a reference tree. You’re starting from one paper and you find maybe tens or maybe hundreds of them. You can also do the reverse reference: you found this paper and then you find the other people who cited this paper, too. So both ways you can find a lot of papers for the subject you’re interested in.

9.d. Graduate students utilize a wide range of materials for their dissertations, including online films and images.

GS-VCS-03--: Books, journals, online resources, um... original language resources, which include either online websites or journals, or books too. Both English language translations also, if my subject deals with an object from some other culture, also original language.

GS-VCS-02--: [I use ILL] for everything: books, journals, I just, yesterday I got a book and a video. [...] A lot of people in Visual and Cultural Studies work on contemporary art. [ArtStor is] not particularly helpful in terms of contemporary art images, it is better to look on, like, Google. Or scan your own images. Or the library also has an image database catalog, and that has more contemporary stuff in it because users have requested specific images.

GS-Engl-01--: I’m writing about a play production that I saw. And it would be great, I’m still trying to figure out if the company would send me stills or something from that production, but what would be ideal is if I could insert some still shots in that draft so that that would be readily accessible to visualize what I’m talking about.

10. Many of the graduate students in our study use the library as one of their sources of information and research rather than their sole or primary source for discovering what academic literature exists.

10.a. Many graduate students come to Voyager already knowing that the item they seek exists either physically or as an electronic resource, as opposed to using Voyager to see what is available.
10.b. Graduate students generally get the journal articles necessary for both their work and their sense of mastery of their field via databases made accessible via the U of R library online databases page. However, graduate students do not consider these databases to be the same as “the catalog” or “the library,” and refer to them primarily by the database name.

10.c. Sometimes, graduate students will go to Google for easy access to known content.

10.d. However, graduate students find better resources through the library website or library databases than through alternatives such as Google Scholar.
**GS-Engl-04--**: I’ve tried it [Google Scholar], but I don’t think it’s as effective as the library database. [...] Sometimes it’s good because you can see what’s out there. And honestly, um, sometimes if I don’t know much about a topic at all, I will just Google it first, or like look at the Wikipedia article or something really sketchy like that, just to see what’s out there, and you can easily come up with pretty relevant stuff. And then I would go to the library and apply what I’ve done and look at more reliable sources. [With Google or Google Scholar], you can’t even access the articles, it seems like. You can learn about them, but then you have to go to the library site anyway, so….

**GS-Phys-02--**: I tend to use APS, but I think some of my colleagues in the group use Google Scholar a lot, and the nice thing about that is that it can really hone you in on the quote-unquote important papers, the highly cited papers [...]. [...] The other nice thing about at least APS is that you can do forward, you can look for forward references.

**GS-Engl-01--**: I do occasionally use Google Scholar, although probably not as much, just because I found that, in terms of getting full-text of things, it’s still sometimes easier to just go through the library rather than trying to use Internet sources. But I do occasionally do Google searches or Google Scholar, especially because I’ve been trying to find evidence of other performances, so that would mean, you know, I’m really looking for actual theaters’ websites, that would be listing performances or maybe having photos of performances, so I’ve been trying to do that recently, too.

11. Graduate students employ varied ways to communicate with their advisors.

11.a. Many graduate students communicate with their advisors in person rather than by email because the professor is “inundated” with email.

**GS-Opt-01--**: We don’t do a lot of email because my advisor told me that he’s really busy and every day he says he gets like 100 emails that told him they need a post-doc position. So email is not a good way for communication with him. When he is in his office he will open his door, so we just walk in.

**GS-BCS-02--**: My advisor – so the way it works with him is he has his door open and I walk in anytime I want. I can write him an email and ask for a more structured one and half hour period of time. Or I can just stop by and chat and say “I just want to work on this.”

**GS-Psych-01--**: I’ll read a ton of articles and get really excited and then eventually I’ll probably make an outline and take it to my advisor.

11.b. This face-to-face contact with the graduate student’s advisor is prevalent for communication that does not have to do with feedback on drafts of the student’s work. Draft feedback is generally conducted through hard copies of the document that are given to the professor in person or placed in her or his mailbox, rather than receiving feedback in face-to-face discussions or emailing the draft as an attachment.
 GS-Biol-01--: Especially for the grant, [my advisor] wanted to put as little input as possible because she has to write a statement about how much input she had so she never wanted an electronic copy; she only wanted to read you know well-revised drafts, so I’d give it to the girls to read first, other grad students would read it, and then when it is polished, I’d give it to her, and then again she’d give me comments, I’d give it to everybody else, and give it back to her.

 GS-Engl-01--: Most of them like hard copies, so emailing to them doesn’t usually work. I mean occasionally they’ll print something off if it’s really short, but otherwise I print everything off and take it to them and leave it in their mailboxes.

 GS-Opt-01--: I think, because my advisor is like 50 years old, so he’s more old school than I am, so in that case, in fact he’d prefer correcting on hard copy only. Just print off, give him and he will change everything with a pen on the paper, and then you grab it back, and you’re checking everything.

 GS-BioEng-01--: I would print it out, and sometimes if he’s [my advisor] really busy I would leave it in his mailbox, and he comes and would pick it up and read it, and give me feedback.

 GS-VCS-02--: If I notice things I will mark them on other peoples’ drafts. And that’s just part of the basic comments. I mean, usually, what we will do is to receive the draft, print it out, um... and make comments on the paper, the actual piece of paper, and possibly on another sheet of paper. And, on that, includes the, like, ideas, and also the grammar. So then I just give it back to the person when I’m done. And so they can do with it what they like. And then I get them back as well from people.

 GS-Phys-02--: So, typically when you write a paper in this group, you write a paper and then send a draft to the various authors, and they typically write their comments on it and then just give it back to you to make changes [...] in hard copy. But then, as it gets further and further along, typically what you might do is sit down kind of together as a group or with John, and just kind of get through it, and talk about how to phrase things, how to approach ideas, in a way that’s coherent and clear and still catches the bulk of your audience. So it depends, I guess, on the stage of the publication.

 GS-Engl-01--: We email to each other but then always print. So we always come to the group having physically marked up each other’s copies, and then we all give them to the person after the discussion.
**GS-Biol-01**: Yes [we’d hand each other paper copies], or e-mail. But we all, I don’t know, I feel like for revising you need a paper copy to write in.

**GS-BCS-02**: [I share my work] in hard copy. And I encourage them to make any comments they want, and rip it apart if they want.

12. **Graduate students fear that technology may fail.**

12.a. They employ various workarounds as protection against this.

**GS-Biol-01**: Yes, I have Excel spreadsheets of all my data, I have paper copies, copy on my computer, copy on the lab computer, copy on my thumb drive – it’s backed up everywhere.

**GS-VCS-03**: For years I’ve thought about one of these websites where you could back everything up, I don’t even know what it’s called at the moment, but there are places that you can actually have your entire hardware – I mean, hard drive – backed up. Um, so maybe at some point this semester, when this is valuable, [I will start] backing up somewhere online.

**GS-VCS-02**: [Backing up has] been one of my major concerns of the past year. I have, I used to back everything up on CDs, and I have, like, years of CDs and stuff. I also have, I am continuing to back up on CDs because I need to buy an external hard drive. And I haven’t done that yet because I get slightly paralyzed trying to figure out which electronic device to buy and everything like that. [...] Most things are in paper and/or on DocuShare and Google Documents. I tend to keep the stuff for like, my TA work, and anything apart from my dissertation on Google Documents.

**GS-Psych-03**: Yeah I actually lost about a month [of citations when my laptop was stolen], so anything I had entered into the system using Sente [Mac application] the month prior to having my laptop stolen was lost, but I keep a pretty up to date back up of most things.

12.b. Knowing what they would lose if their electronic technologies fail, graduate students use paper as a backup strategy.

**GS-Engl-01**: [Without an off-site backup] I still feel like my documents aren’t really safe, in the versions where they are, which is why I obsessively print things, too, because at least I know that if I have a hard copy, I’m not totally back to zero.

**GS-Engl-05**: I generally back up my PDF files and my research papers, but my general notes, I haven’t had the habit of doing that; I am trying to get more into it. So until I get into that I somehow still prefer using just a pen and paper [especially since I lost many notes when my last computer broke.]
12.c. Graduate students also use email as a backup strategy.

**GS-Engl-05**: I like Gmail [...] so it makes me feel comfortable in mailing things to myself, which is another way in which I back up my material, and I make my titles really detailed so that I can search for them [...].

**GS-PoliSci-01**: I do it [email files to myself] all the time.

**GS-Phys-02**: Oh, you email it to yourself, typically.

**GS-Engl-01**: I saved a lot of stuff backed up on email just to have it another place. [...] I basically have this Gmail account that I don't do anything with except email myself.

**GS-Psych-02**: If I've done a lot of work on a draft of something, I'll e-mail it to myself; I have a Gmail account that I email it to.

13. The graduate students in our study viewed the dissertation both as a project and as a major step in an ongoing process of individual and career development. They are interested in finding ways to put their work “out there” where it will be noticed.

13.a. Some graduate students would like to use a university-affiliated online repository for their dissertation and related materials, and for their conference presentations or papers. This is particularly true for students whose work involves multimedia sources that are not easily preserved on paper.

**GS-VCS-03**: I have always had the idea, the notion that [my dissertation] will go on DSpace. Especially since DSpace has the capability of supporting multimedia: sounds and images.

**GS-Psych-04**: For the PowerPoint, that’s a good question, if something like UR Research was there, I would probably make those available both for when we’ve done posters and for when I’ve done actual talks. I’ve seen some other people here in the Psych department that will use Psych department web space and you know, we all have our own individual pages there so that people can put in links to you know PDFs of their PowerPoint presentations and things like that. But no, I wouldn’t necessarily want to hold those back. That’s also one thing where you know we always have hand outs available and if anybody asks or anybody emails, we’re always very happy to send those things out. So putting them online, making them available that way, I’d think about it but I would probably do it.

**GS-Engl-01**: In my first chapter [...], probably if I were putting this in electronic media I would put clips, because I’m talking about two specific performances and I have both of them in film versions, one of them is a DVD and one of them is saved on my laptop, so that would actually good to have some clips for that. I think [my committee] would [be open to that], it’s kind of being stuck in generations because if you think of publishing this as a monograph, the audience wouldn’t have access to those things, but if it were
accessible through DSpace or something, then the clips would be ideal because people
would be able to look at them more.

13.b. Humanities students plan to publish the dissertation, or a version of it, as a book when finished.

GS-VCS-03--: I will try to publish [my dissertation] as a book.

GS-Engl-02 --: I think I have something close to a monograph right now; there is another
chapter that will need to be written that deals more closely, on his lyric poetry.

GS-VCS-02--: I hope [I’ll be able to publish it when I’m done]! I mean, I’m writing it in
anticipation of publishing it [as a book]. Um, because it seems like a waste to spend so
many years doing this and not to try to publish it.

GS-Engl-04--: Ideally, [publishing it as a book is] what you’re encouraged to do, yeah. I
mean, I think it’s more realistic, to start off, to see us publishing the chapters as individual
articles. And that seems to be what I’ve observed people do, and then they try to publish
the whole thing as a book after revising, of course, again and again. But yeah, so I’d like
to publish chapters of it. And once you get really going on a dissertation, you might be
able to start submitting chapters to journals even before you’ve got it all squared away.

13.c. Psychology, science, and economics students are less concerned with preserving the form of the
dissertation by publishing a book and instead are focused on generating journal articles from their work.

GS-Psyh-04--: When it gets finished I’m sure it will just be the standard 100 or so page
thesis, all of basically focused on one study. When it gets published is actually what I’m
really concerned with, this study it might actually be just one, hopefully one very high-
level journal article. The nice thing about a project like this though is that there are some
questions that we can answer with the data we have. So that we will be hopefully that I
will be able to get tenure based on this series of articles that can get published out of a
data set like this. […] So the dissertation itself, I don’t have any special plans for it just as
dissertation and you know hopefully one […] article, at least, out of the dissertation
when it’s finished.

GS-Econ-01--: I need the three or four different papers and I have one paper ready and
one-fourth of the other one. So I still have to do another. […]Yeah, [publishing each as a
journal paper] is the aim.

GS-Psyh-01--: No, [I wouldn’t publish my dissertation as a book,] it would be as an article
or a series of articles in a journal.
B. Implications of findings for our software

As we analyze and interpret the data, we look for web-based technologies that meet graduate student needs. These technologies may already exist, in which case we will try to bring them to students in a way that lowers barriers to entry. If no solution exists, we may build one ourselves.

In this section we describe 20 ways in which we would like to support student work practices. We are already in the process of implementing numbers one through ten. We hope to address the remaining ideas either with the new system, or by other means, as time and resources allow.

1. Ways to manage drafts or versions.

   **GS-VCS-01**: As far as versions and drafts of papers go, it depends where I’m at with it. I don’t use the “versions” feature in Microsoft Word. I save a copy by date. So, if I’m working on today, I will say ok, “Chapter 1 October 15.doc.” And I’ll have an October 14th and October 12th, until I know I’m that ready to let go of some of the stuff that I’ve deleted or changed. Sometimes – again, because my writing process is – I’m not entirely sure half the time which way it’s going to go.

   **GS-Engl-04**: So far what I’ve been doing is, like, I make a new doc. Like, I copy and paste to make a new document every time I want to make a new revision. So I have, like, “Version 1”, “Version 2,” “Version 3.” So that’s what I’ve been doing, because I want to save the old version in some way.

   **GS-Engl-02**: Usually what I do if I am cutting out large sections, removing large chunks, let’s see... so for each chapter, for each major section I will have sort of an edit, or discard, file. All the things that were in there at one point in time but are actually not quite working with the argument as it took shape. I have found I actually, as the dissertation developed, I have been able to cherry-pick a lot of stuff from that, from those edit collections. That is what I tend to do with – I don’t tend to have too many hardcopies clogging it up.

   **GS-Engl-05**: I name them, so like the prospectus over here, this computer has it from draft five onwards, earlier draft are I think on his computer. So I have a very clear progression of drafts. My first draft is never my final draft.

   **GS-PoliSci-01**: I don’t [currently have a file-naming convention for managing drafts]. I have thought about it and there is one professor that I work for that does a better job of it. I have been trying to think of it, “How do I want to do it?”’, but I don’t know.

   **GS-Engl-01**: I do tend to save versions of things. Not with all of my documents, but one way of saving versions is the email method, which I know is fallible – but because at least I know I can go back to a particular date and open that version, and you know if there was something I had in that that I don’t have in the current version I can pull it out. [...] I
basically have this Gmail account that I don’t do anything with except email myself [documents].

GS-BCS-01--: I had saved each copy [separately] that I received [from my collaborator].

GS-Psych-01--: When I started out at grad school, I would just edit things and save them as the same every time. And then my advisor has gotten me to where pretty much every time I open it, it’s saved as a different file [...] a lot of times, I’ll just save it by the date. And actually I didn’t like that at first, but I like it now because then I can go back to old drafts in case I decide I want to put something back in or whatever.

GS-Edu-01--: I, you know [go back and forth between paper and computer while writing], and I keep the electronic files too, of course. It gets a little complicated because then I have all these files that are different and I can’t remember which one’s the most recent. [...] I keep it, because at this point, it’s all fair game for reworking into a chapter of my dissertation.

2. A means to manage or synch drafts or research files between multiple computers.

GS-Polisci-01--: [At the moment, if I write an important draft,] I put it on here somewhere and hope I remember where it is, umm... I am pretty good about not overwriting things, so it’s usually not a problem as far as I know, but it can be a problem sometimes if I have to look through and just try and get some stuff.

GS-Phys-02--: Synching is useful. The problem with that is...first it has to be simple, because you don’t want to come in the morning, take five minutes to figure out, set up the syncing, and you don’t want to wait five minutes for it to do its job.

GS-Edu-01--: I wrote it in the library on a borrowed laptop [and saved it to] a little thumb drive [which] was useful for that when I borrowed laptops.

3. Ways to share work with others in the same field either within or without the University of Rochester, both for instances of collaborative work and for non-collaborative feedback groups.

GS-Psych-04--: I’ve talked with other graduate students at other universities that some projects that we get to do together and we thought about, “Okay, let’s set up one of the Google groups to be able to share files and things like that.”

GS-Opt-01--: We have a big collaboration with some other universities, so we will have teleconferencing like every week. So basically, every, I think about every five weeks we need to prepare for some kind of presentation to show our results. [...] We use Microsoft PowerPoint. We use that. [...] We call to some number, and then we put our presentation file onto some server and we can control the flow of the presentation something like that. It’s kind of high-tech.
4. Ways for graduate students to backup their files, or reminders that they should do so.

GS-VCS-03--: [I would like to use] some tool – I don’t know if tool is the right word – but some technology where you can share your work instantaneously, more easily, with your colleagues. But I don’t know what shape or form that would have. But yes, you could email something to somebody and get feedback.

GS-VCS-02--: [Backing up has] been one of my major concerns of the past year. I have, I used to back everything up on CDs, and I have, like, years of CDs and stuff. I also have, I am continuing to back up on CDs because I need to buy an external hard drive. And I haven’t done that yet because I get slightly paralyzed trying to figure out which electronic device to buy and everything like that. [...]Most things are in paper and/or on DocuShare and Google Documents. I tend to keep the stuff for like, my TA work, and anything apart from my dissertation on Google Documents.

GS-Engl-03--: I desperately need [...] one of those external hard drives because everything is on here.

GS-Engl-04--: That’s my backup [CD]. [I make a backup CD] every time I do a new draft. Like, if I have “Version 4,” which I’m going to work on soon, I would want to back that up.

GS-Psych-03--: Yeah I actually lost about a month [of citations when my laptop was stolen], so anything I had entered into the system using Sente the month prior to having my laptop stolen was lost, but I keep a pretty up to date back up of most things.

GS-Econ-01--: Every six months, more or less, I do a backup in CDs.

GS-Phys-02--: Synchronization is probably a smart idea because then it’s like you’re backed up, you know. If this computer goes down, then most of the data is already on the server. If the server goes down, then the data’s here. So the data is always in three places and so... I hadn’t thought of it that way, but that’s a smart idea, or that’s another reason why having the server and doing the synchronization is good.

GS-Engl-01--: I have this flash drive and I have another flash drive that’s more a conglomerate of class things, but some backup. And I saved a lot of stuff backed up on email just to have it another place.

GS-Psych-02--: I’m pretty religious about backing everything up, so [I backup] at least weekly and like the dissertation folder actually gets backed up more often. I do - like if I’ve done a lot of work on a draft of something, I’ll e-mail it to myself; I have a Gmail account that I email it to also, and you know I burn DVDs and stuff, so I do.

GS-Biol-01--: I have paper copies, copy on my computer, copy on the lab computer, copy on my thumb drive-- it’s backed up everywhere.
5. A way to back files up from any computer to one secure location.

GS-VCS-01: I save my stuff, and then I back it up to – I have an external backup drive. I have two external backup drives, especially for the thesis. And then I hide it [...] my little [portable] drive I hide, and then my other C: drive I have by my desktop. I just don’t want it to be broken in to. You know, if somebody stole my laptop, I’d be done for.

GS-Engl-01: I guess one comment I would interject is that if there were a way for me, if my department had a way for me to upload documents in progress that didn’t have to be accessible to anyone else, like if I had an account that I could use more readily, I would do that. Because this [emailing documents to myself] is clearly not the best way.

GS-VCS-03: For years I’ve thought about one of these websites where you could back everything up.

6. Ways to help graduate students synchronize files from multiple computers, even across operating systems.

GS-VCS-03: I have to [synchronize backup from multiple computers] manually.

GS-Psych-02: I do [have to transfer files between my laptop and desktop]. I actually am like almost completely using my USB; I have a one gig USB that I pretty much keep everything on, because I’m in so many different places, that it would be impossible to just have things on one computer.

GS-Psych-01: I have my jump drive in here somewhere, because that, a lot of times, I’ll use this to take home... But even though I got a laptop so I could take it home, a lot of times I’m too lazy, I don’t want to take it home, because we have to walk about half a mile to get to our cars.

GS-ElecEng-02: I need some software that can transfer data from two systems [Linux and Windows], that is very important for me. Now, see, this shows that I use IE Explorer in our Linux system, there now, and this the data I saved in the Linux system, but we can also access the Windows to open the data. I save it as .txt files.

7. Easy ways to print out any documents held online in systems that we develop, or otherwise make it easy to coordinate electronic and paper versions of drafts and information.

GS-Engl-05: I generally back up my PDF files and my research papers, but my general notes, I haven’t had the habit of doing that; I am trying to get more into it. So until I get into that I somehow still prefer using just a pen and paper [especially since I lost many notes when my last computer broke.]
GS-Biol-01--: Yes, I have Excel spreadsheets of all my data, I have paper copies, copy on my computer, copy on the lab computer, copy on my thumb drive-- it’s backed up everywhere.

8. Ways to create and share versions of their dissertation-related research as separate final products such as conference papers, conference presentations, or journal articles.

GS-VCS-03--: [My forthcoming publication in an anthology] is a section of my last chapter [...]. So the chapter is composed of a number of different components, they’re modules that I’m putting in.

GS-Econ-01--: I need the three or four different papers and I have one paper ready and one-fourth of the other one. So I still have to do another. [...] Yeah, [publishing each as a journal paper] is the aim.

GS-Psych-02--: I think there are a lot of publications that can come out of my project in a number of different ways and will all probably lead to next steps, which is what you need when you then go on the job market and want someone to hire you.

GS-Psych-01--: We present almost yearly at different conferences, so I’ll be presenting on my two-year in March, at SRCD, which is Society for Research and Child Development. And then, we pretty much present every year, so if I don’t have something from my Master’s data, or from a dissertation, I would present some of my advisor’s data, and work with her on that and present, so that we can present every year at a conference.

GS-Engl-04--: Once you get really going on a dissertation, you might be able to start submitting chapters to journals even before you’ve got it all squared away.

GS-ElecEng-02--: Yes, [the dissertation will build on what has already been published as a paper]. In the paper, we only show the new idea, and prove it. But for the dissertation, we need more basic information and basic knowledge there.

GS-BioEng-01--: Yea, actually for this conference I went to they needed a paper [and the presentation, both from what will be one chapter of my thesis], so I wrote a paper for this presentation, I submitted a paper and it’s already published, it’s published in one of those blue books [points at shelf].

GS-Phys-01--: That’s right, [I have published already]. So I was lucky enough to have chosen a group in which we did exciting research, and we got good publications and a number of them, so that by the time it came for me to write the dissertation, the only thing which was a challenge was figuring out how it, was figuring out the title, you know how they all, you know, figure into a unified thesis.

9. Ways to help humanities students who seek to publish their dissertations chapter by chapter or as monographs.
GS-VCS-02--: I hope I’ll be able to publish it when I’m done! I mean, I’m writing it in anticipation of publishing it [as a book]. Um, because it seems like a waste to spend so many years doing this and not to try to publish it.

GS-Engl-04--: Ideally, [publishing it as a book is] what you’re encouraged to do, yeah. I mean, I think it’s more realistic to start off to see us publishing the chapters as individual articles. And that seems to be what I’ve observed people do, and then they try to publish the whole thing as a book after revising, of course, again and again. But yeah, so I’d like to publish chapters of it. And once you get really going on a dissertation, you might be able to start submitting chapters to journals even before you’ve got it all squared away.

10. Ways to use an online repository for disseminating supplemental materials for their conference presentations and papers, as well as for their dissertation.

GS-Psych-04--: For the PowerPoint, that’s a good question, if something like UR research was there, I would probably make those available both for when we’ve done posters and for when I’m done actual talks. I’ve seen some other people here in the Psych department that will use Psych department web space and you know, we all have our own individual pages there so that people can put in links to you know PDFs of their PowerPoint presentations and things like that. But, no, I wouldn’t necessarily want to hold those back. That’s also one thing where you know we always have hand outs available and if anybody asks or anybody emails, we’re always very happy to send those things out. So putting them online, making them available that way, I’d think about it but I would probably do it.

GS-VCS-03--: I have always had the idea, the notion that [my dissertation] will go on DSpace. Especially since DSpace has the capability of supporting multimedia: sounds and images.

GS-Engl-01--: In my first chapter [...], probably if I were putting this in electronic media I would put clips, because I’m talking about two specific performances and I have both of them in film versions, one of them is a DVD and one of them is saved on my laptop, so that would actually good to have some clips for that. I think [my committee] would [be open to that], it’s kind of being stuck in generations because if you think of publishing this as a monograph, the audience wouldn’t have access to those things, but if it were accessible through DSpace or something, then the clips would be ideal because people would be able to look at them more.

This concludes the list of findings that are being implemented in the current software. The following are findings that we are considering for future development, time and resources allowing.

11. A means for easy searching and retrieval of useful information in known resources, to aid in keeping found information found.
GS-Edu-01--: I have this closet here, and it’s full of big boxes full of files, but they’re not, I’m not that organized. [Starts to head into a walk-in closet] So, when I work on a paper, I take all of my materials and copies of things, and put them in a manila envelope and label it and then throw them in a box. So you know it’s not a perfect system, but [...] whenever I need something, if I can’t find it in my computer – typically I can, but I don’t want to keep printing these things. But if I know... these envelopes correspond to files in my computer, so if I know what envelope to look in....

GS-ElecEng-02--: Sometimes I will print out some, for example, pictures that are interesting and stick on my notebook. And my test results. Sometimes I will print out graphs, data, and sometimes I will draw it and then glue a picture. I also use some, I will write the date of the things I am working on, and today’s work, and what I will do in another notebook.

12. A way to help students take notes separately from their annotations/marginalia, find the right notes later on, so that they can use them to synthesize their ideas.

GS-VCS-03--: For example, one of my chapters takes a philosophical argument of singularity, the politics of singularity. So I kind of take notes of different arguments about the notion of singularity from Derrida, from Heidegger, and I kind of go in a sequence so I have quick access to that. And I always use the Word “find,” so I could immediately find the key word that I’m looking for. But I do have those notes.

GS-BCS-01--: I have a little [...] composition pad sort of things and I use that mostly for, like, during the meetings when we talked about papers, but every now and then when I was reading along with the paper, I would make notes in the book [during] the meetings about the chapter that we were writing.

13. A way to find the relevant annotations or quotations within readings later on.

GS-Psych-03--: I start physically filing things by an author’s last name. In some ways it’s kind of an inefficient system. So if I want to find all the articles that have to do with performance (garbled) is one thing that I studied. Um, well, everything is filed by author’s last name, so how would I find out?

GS-Engl-03--: [If I found a quote] I would type it and then it would get lost in there. I have things that seem useful in the moment can sometimes I don’t remember why they were useful two months later, so there is a lot of stuff on this computer that is just kind of floating in there.

14. Ways to keep track of which research materials they have already read.

GS-Psych-01--: I think this is probably actually already available, I just haven’t used it, but we have this program called RefWorks that’s kind of like EndNote, I’ve been told that EndNote is so much better or that RefWorks is so much better, but something like that
where I can go from finding an article, to getting a record of it somewhere, so knowing that I have it, and having my own notes in there about the article, and then be able to go to that to create like an outline and, go from there. I think the missing link is really from, “I have a record of a lot of the articles,” but getting from there to like my outline is a little bit harder.

15. A means of versioning that is designed to support editing on paper rather than onscreen.

GS-VCS-01--: And one of the most important steps in my writing is printing it out, and editing what I’ve got, on the paper. And drawing little arrows, “Okay, that’s got to move there,” “that’s got to do that,” “that argument has to develop.”

GS-Engl-01--: I prefer to comment on my own work with pens, rather than using the commenting function most of the time.

GS-BCS-02--: I write it on the computer, but I keep printing it out and I can’t make changes on the computer, I print out every time I write it out, and make changes on there and throw away drafts.

16. A way to help the student keep track of where they keep their prewriting or research materials, which very well might not be on the computer where the main composition is done.

GS-Engl-02 --: Sometimes actually, I have a stack or note cards back there on my desk, and some on my coffee table. A lot of times I’ll actually write things down on note cards, just jot things and just remember it and go back and put it into prose. [...] The advantage of the note card I can write the note and then if it is referring to something in a passage of poetry or a criticism, I can just put it into the book at that place.

GS-VCS-03--: I have a little notebook, where I do that [brainstorming and outlining].

GS-Engl-05--: I tend to work with lists and flash cards but I am trying more and more to use the white board just because I have noticed that I use, that I lose a lot of my flash cards. So two things that I have adopted and one of them is working really well is just a little reporter’s notebook that I carry everywhere. Which I really scribble notes on. It’s much disorganized. But it’s really helpful as everything is in one place and I can find stuff easily.

17. A means for graduate students to manage their projects or deadlines, particularly for collaborative work.

GS-Psych-04--: Um, there’s another professor here in the department that I work on a study with. And we email documents back and forth about when things need to get done.

18. A way to manage feedback on written work, both on the graduate student’s own work and the feedback given to others’ work.
**GS-Engl-04--:** Last week was my week [to have my dissertation group read, comment on, and discuss my work]. So then I like, I have all of their comments, and I kind of synthesize them into my own document. Like, I summarize them into a document so I can look at just one thing and not be, like, going through all of them. And that’s how I revise.

**GS-Engl-01--:** Some of my piles here are, you know, having four drafts of something, for a dissertation group meeting, which adds up to a lot of paper.

**GS-Phys-01--:** Yes, so the way in which it works is that you have one first author, who is lead author, and normally he would write up the paper from scratch and then he would pass it around and we’d give him feedback and then he would update and so, again it’s thirty drafts – gets complicated.

**GS-Psych-02--:** Yes, we track change back and forth. It actually works really well, we’re really good at editing with each other. We sort of talk about how we cut things. And she’s big on, if she edits something of ours, she’ll track change and she’ll put comments, and it’s sort of like our job to reply to the comment in the comment box, so that she knows that we read it, and are responding in some way. It might be like: “This doesn’t make sense, what do you mean?” or “I think you need to expand on this, or why did you say this?”

**GS-ElecEng-01 --:** Yes [I manage my collaborators’ feedback], we have twenty-one emails about this proposal. [I organize the emails in] a folder.

19. **An easy way to email documents to oneself or to a storage place.**

**GS-Engl-04--:** Or sometimes, uh, what I do with more quick backups, is I just email myself the document as an attachment so that I have it in my email folder. So that it’s there, at least.

**GS-PoliSci-01--:** I do it [email files to myself] all the time.

**GS-Phys-02--:** Oh you email it to yourself, typically.

**GS-Engl-01--:** I saved a lot of stuff backed up on email just to have it another place. [...] I basically have this Gmail account that I don’t do anything with except email myself.

**GS-Psych-02--:** If I’ve done a lot of work on a draft of something, I’ll e-mail it to myself; I have a Gmail account that I email it to.

20. **Ways to help psychology, science, and economics students generate journal articles from their dissertations.**

**GS-Psych-04--:** When it gets finished I’m sure it will just be the standard one-hundred or so page thesis, all of basically focused on one study. When it gets published is actually what I’m really concerned with, this study it might actually be just one, hopefully one
very high level journal article. The nice thing about a project like this though is that, this there are some questions that we can answer with the data we have. So that we will be hopefully that I will be able to get tenure based on this series of articles that can get published out of a data set like this. [...] So the dissertation itself, I don’t have any special plans for it just as a dissertation and you know hopefully one [...] article at least out of the dissertation when it’s finished.

**GS-Econ-01**: I need the three or four different papers and I have one paper ready and one-fourth of the other one. So I still have to do another. [...] Yeah, [publishing each as a journal paper] is the aim. [She even refers to the dissertation chapters as “papers,” rather than “chapters”!]

**GS-Psych-01**: No, [I wouldn’t publish my dissertation as a book,] it would be as an article or a series of articles in a journal.

**IV. Applications**

We asked the University of Rochester librarians whether they would ever make use of what they learned in this project and, if so, how. We did not limit librarians to digital technology ideas, but encouraged them to think of any way in which they might apply what they learned – to service, to facilities, to any aspect of their work with graduate students. Here are their ideas:

1. **Add names of advisors to our dissertation records in Voyager.** Students want to see dissertations done by other students with the same advisor, not just any dissertation or even a dissertation in the same department.
2. **Build a space in the library for graduate students only.** This would have lockers or places to store books, laptops, etc. for graduate students who do not have offices. This would also help them to work in groups, providing a quiet area that does not have an “undergraduate feel” to it. This space might offer free printing, which is particularly an issue for humanities graduates. This space could also house spaces for article and book swaps, as well as being the home of style guides and reference works. This project is currently underway.
3. **Build on previous efforts to inform graduate students about:**
   - Bibliographic management software (RefWorks, EndNote, etc.)
   - Citation Index databases.
   - Citation linker
   - RSS feeds
   - Journal tables of contents
4. **Create a web page that lists targeted tools and capabilities of interest specifically to graduate students.** This page would include both the tools and a list of resident experts on those tools.
5. Explore ways to increase face-to-face contact with graduate students including office hours in the departments, a “lab librarian,” and staffing the new graduate student space.
6. Contact students when they are ready to write their dissertations and are doing extensive literature reviews.
7. Build a widget that can grab bibliographic information from any place on the web and turn it into a library request (purchase or ILL).
8. Explore ways to work more closely with the graduate student organization. Engage students in new initiatives.
9. Build a tool that lets a graduate student pull all tables of contents together in one place.
10. Offer students the option to purchase a book if they have written notes in it.
11. Facilitate and publicize book swap services (physical and online).
12. Offer to create a library of student-generated reading lists for the use of any interested graduate student.
13. Build a tool for articles that would suggest, “If you are interested in X article, you may be interested in Y article.”
14. Provide instruction on how to request film, images, audio files, and other such items.
15. Conduct ongoing work with graduate students to collect information about their practices and needs and to learn what tools they are using with success.
16. Create a very powerful and quite targeted RSS feed, perhaps pulling from ISI. This feed will very specifically target ten journals of interest to graduate students on narrow terms that appear in the title or the subject field.
17. Create an easier way to bookmark a specific graduate student’s favorite databases.
18. Create specific applications for iPhones, smart phones, and other devices widely used by students.
19. Create a fund for purchasing original numeric or non-numeric datasets from graduate students for use by others via UR Research.

V. Implications for Institutional Repositories

Institutional repositories may succeed under two conditions. One is that users self-mandate or are mandated by their institutions to deposit works of certain kinds into IRs. Such mandates are emerging, for example, for doctoral students upon submission of the dissertation. Recently, Harvard’s Faculty of Arts and Sciences voted that all FAS faculty members must self-archive articles into the University’s repository. We wait to see the results of these mandates.

The other way that IRs may succeed is if they provide a better technology to meet users’ real needs in clear and immediate ways. This is the path we are attempting to take at the University of Rochester. The research described above reveals several ways in which current and emerging generations of faculty members need better, more powerful, and less complicated tools to support their writing and publishing. We believe that they need a system that helps them write and that makes it easy for them to self-archive or self-publish that work once it is done.
Particular findings that support this conclusion start with the need graduate students express for sharing their work with the faculty supervisors, their peers, and their writing collaborators. We have documented here and elsewhere (http://www.dlib.org/dlib/january05/foster/01foster.html) that our authors need such tools as versioning, preservation, and web access. They also need to share files with specific people, share files with the world, or keep files hidden.

Graduate students, like our faculty members, need to be able to organize and store the various documents that are part of a writing project in progress. The emphasis is on writing now, not on self-archiving or self-publishing. We believe that if they can store, organize, and gain access to their project documents through our system, they will find it easy to hand off their files for easy submission to the IR by an administrator. We also speculate that a student who gets used to using such a system may be more inclined to do so in the future and then just “click” work into the IR at the end.

We are struck by the fact that our students shift their work processes over time, trying various bibliographic applications, for example, or using outlining and other writing processes inconsistently. It is tempting to reach for the killer app that will enable them to do everything: find, annotate and store journal articles; schedule their dissertation-writing tasks; co-author on a shared writing surface; communicate with faculty members and peers; manage citations; submit manuscripts to journals and presses; and so on. However, the reality is that this is improbable and maybe even undesirable. Instead, we hope that our system will, in time, be able to integrate with other tools that graduate students use to support their academic work.

First and foremost, the digital tools we build must be straightforward and easy to use. Since graduate students fear computer failure and loss of data and files, we want to highlight the fact that our system safely stores and backs up everything they put into it. Since graduate students are challenged to get access to their project materials from many different locations, we want to highlight the fact that they can reach anything they put into the system from any computer with an Internet connection. And, since they work with colleagues and co-authors from many different institutions, we want them to know that our authoring tools enable them to share files with anyone who has an email address.

We hope to have our system fully operational in 2009. Then, time will tell how well it is used and whether it meets the needs we identified in our research. We are optimistic that we will succeed in filling a gap – authoring tools – and providing a system that meets immediate needs – storage, organization, access – and encourages self-archiving and self-publication and, thus, open access to scholarship.