

# Rapid Return

Electronic exam return: save time, space, and money

University of California, Irvine

Application for  
2007 Larry L. Sautter Award for Innovation in Information Technology

## Overview

Returning exams can be a burdensome task to faculty involving distribution, collection and storage of graded work. UC Irvine's new Rapid Return system uses barcode-assisted imaging technology to automate indexing and distribution of exams to electronic student DropBoxes via the Electronic Educational Environment (EEE) DropBox tool. The new process reduces costs, improves turn-around time, and simplifies resolution of grading challenges.

The investment of instructor time and the dedication of campus space to the process of returning and storing graded exams are such an accepted part of the educational process that few people even look at them as processes ripe for streamlining. But, the Rapid Return system demonstrates that realistic improvements can be made to such status quo processes.

## Traditional Exam Return and Challenges

Student exams are normally graded and handled in one of several ways.

- **No return**  
No exam copy or feedback returned to the student.  
[Challenge: Lost opportunity for student growth.](#)
- **Partial return**  
Manageable exam portions, such as multiple-choice results, are returned to the student. However, no further feedback is provided.  
[Challenge: Reduced opportunity for student growth.](#)
- **Return in class**  
Original or photocopied exams and feedback are returned to students during class time.  
[Challenge: Class time spent returning exams; lack of privacy/security.](#)

- **Return in office hours**  
Students come to the instructor or TA's office hours to retrieve their original or photocopied exams and feedback.  
*Challenge: Faculty or TA's time spent returning exams; limited hours may not be accessible to all students.*
- **Return in "return room"**  
Students come to a supervised exam return room and present identification to retrieve their original or photocopied exams and feedback.  
*Challenge: Staff time and facilities spent returning exams; limited hours may not be accessible to all students.*
- **Photocopy and email**  
Several departments used a Xerox system to photocopy each exam, manually entered the student's email address, and email the student a copy.  
*Challenge: Time-consuming process of manual email-entry (minimum 2-days); poor error handling (no notification if emails lost/bounced due to spam filtering, accidental deletion or exceeding inbox quota).*

With each method that involves returning an original exam to a student, there is the additional challenge of preserving the integrity of the original document if the assigned grade is later challenged. To address this issue, some faculty have resorted to photocopying exams before returning them, thus ensuring that an authentic version is available. This is an additional burden on the faculty who must prepare and store a complete archive of each exam to account for the possibility of a student challenging his/her grade.

## The Solution: Rapid Return

Faculty members sought out their computing departments to ask for a better way to return graded work to their students. The computing departments came to Network & Academic Computing Services (NACS) and to Distribution and Document Management (DDM), who ultimately collaborated to create the Rapid Return system. In this collaboration DDM developed the Web applications that facilitate a streamlined scanning and indexing process, and handles the day-to-day operation of document scanning, indexing, and preparing image files. NACS manages the EEE Website (UC Irvine's Academic Portal), which facilitates the uploading of image files and distribution to student DropBoxes. EEE also provides instructors with tools to monitor when students download the exam files.

Description of the technology employed:

Prior to conducting an exam, an instructor authenticates and uses a Web interface to enter descriptive data about the exam and creates a customized cover sheet. The printed cover sheet displays a barcode and an area for students to print their

student ID and fill in the corresponding bubbles. The cover sheet becomes the first page of every exam.

When the examination and grading processes are complete, DDM picks up the documents and begins the scanning and indexing steps. The barcode serves as a pointer to course data previously entered by the instructor. Specific data consists of the class ID, exam title, and version number. The student ID is indexed from the handwritten student ID numbers using Intelligent Character Recognition (ICR). The scanned student ID is validated against the UCI student directory. Inconsistencies are verified visually by DDM staff who compare the ICR output with the image of the handwritten and bubbled student ID on the cover page and correct the error.

The Rapid Return system releases the PDF file along with the indices to the internal server. A Windows service program renames the PDF file using the indices, then batches the files by exam version, and creates a secure ZIP file. The Rapid Return system automatically sends an email to the instructor indicating that the exam scanning process is complete and includes a link for downloading the files.

The instructor authenticates and downloads the files into their computer. The instructor may save a copy of the exams for future reference or simply upload the same ZIP files into the class DropBox through the EEE Website. The EEE system completes a final data check, validating each uploaded file against current class enrollment. If there are any discrepancies such as an invalid student ID, the EEE DropBox will automatically advise the instructor on how to manually associate the PDF file to a specific student. If the student cannot access the EEE DropBox, the exam can be printed and returned in paper form to the student.

When the data checking step is complete, the instructor notifies the students via the EEE class mailing list that the exam is available in the class DropBox. Students log into the EEE Website to view their scanned exams. The instructor can use reporting tools within the EEE Website to see who took the exam, who has picked up the exam, and the time it was retrieved.

To complete the process of managing the paper exam, DDM stores paper exams until 90 days past the end of the academic quarter. The exams are then shredded and recycled.

A pilot version of Rapid Return was launched in Fall 2006. After user-testing and feedback, the program was expanded in Winter 2007, and further expanded in Spring 2007. Full campuswide release will begin in Fall 2007.

The DDM portion of the Rapid Return service is managed as a recharge based activity, and the recharge rate is 5¢ per image, making the cost comparable to a photocopy. The charge covers the cost of scanning, storing original paper files for 90 days beyond the end of the academic quarter, and the ultimate shredding of the exams. Detailed billing information for each exam is available through an online statement.

Full step-by-step Rapid Return instructions are available online on Distribution and Document Management's e-docs imaging service website and as part of the Electronic Educational Environment's public Help & How-to database, so instructor's can access the Rapid Return system from the interface that is most intuitive to them.

Instructor & TA: <https://scandocs.ddm.uci.edu/app/rris/> or  
<http://eee.uci.edu/rapidreturn/>

Student Help: <http://eee.uci.edu/help/student/dropbox/how-to/#rapidreturn>

Additionally, EEE and DDM support staff are available during business hours to provide assistance via phone or email. Upon request, EEE staff are available to meet with faculty members one-on-one to provide assistance or simply give an overview of the system to interested faculty.

**Account of pilot experience:**

Diane O'Dowd distributed an exam to two course sections, with separate exams for each and two version of each exam (**884 students total**). The exams were given Wed, 10/25 and graded by Fri, 10/27. DDM picked up the exams on Mon, 10/31 and processing was complete the next day, 11/01. Diane O'Dowd was then able to retrieve and upload the exams in under 30 minutes.

For full report of pilot program feedback, see **Supplemental Materials (Page 8)**.

**10-STEP PROCESS**

**Scanning** (<https://scandocs.ddm.uci.edu/app/rris/>):

**1. Create coversheet**

The instructor creates a unique coversheet, using a simple web form on the DDM website. The coversheet contains a barcode that is used in the scanning and processing phase.

**2. Attach coversheet**

The instructor attaches the coversheet to the original exam and then makes photocopies for the students.

**3. Direct students**

The instructor directs students to complete the coversheet with their names, student ID numbers, assigned seats (if applicable), and exam date.

**4. Collect assignment**

The instructor collects and grades the exams.

**5. Schedule pick-up**

The instructor boxes up the graded exams and uses a simple web form on the DDM website to schedule a pick-up.

**6. Wait for processing**

After DDM picks up the exams, the instructor waits while the exams are processed. Each exam is scanned, saved as a PDF with the student's ID number as the filename, and compressed into a ZIP archive. After processing is complete, DDM contacts the instructor (24-72 hours).

**7. Download ZIP**

The instructor visits the DDM website to download the ZIP archive.

**Distribution:** (<http://eee.uci.edu/rapidreturn/>)

**8. Return files**

The instructor uploads the ZIP archive to the EEE DropBox tool. DropBox automatically inflates the archive and restricts each file to the appropriate student based on the student ID number.

**9. Notify students**

Optionally, the instructor can quickly and easily notify students that the files are available for download by using EEE class mail lists.

**10. Monitor downloads**

The instructor can monitor whether or not students have downloaded their files through the DropBox interface.

**TECHNOLOGY**

**Scanning:**

Technology used in the scanning process includes:

- MS Window 2003 server
- MS SQL 2005 server
- IIS 6.0
- ASP.Net
- Kofax Ascent Capture 7.5
- Scanner

**Distribution:**

Technology used in the handling of the distribution process through the Electronic Education Environment (EEE) includes:

- Linux
- Apache
- MySQL
- PHP
- Perl
- HTML

## Feedback

In its pilot stage, Rapid Return was used successfully by volunteer faculty in the School of Biological Sciences and in the Physical Sciences' Department of Chemistry.

At the conclusion of the pilot phase, Adrienne Williams and Diane O'Dowd (faculty participants) prepared a report on their experience.

The report evaluated the Rapid Return process from start to finish, including a student poll and a conclusion strongly supporting expanded use.

### STUDENT POLL

"Your graded midterm was available as a pdf for download from dropbox on eee."

- A. I downloaded my midterm and found it useful  
(54% Section A; 58% Section B)
- B. I downloaded my midterm but did not look at it  
(15% Section A; 13% Section B)
- C. I did not download my midterm  
(29% Section A; 28% Section B)

"Would you like the final available as a pdf?"

- A. Yes  
(87% Section A; 90% Section B)
- B. No  
(1% Section A; 1% Section B)
- C. I don't care  
(11% Section A; 8% Section B)

### FACULTY CONCLUSION

We are excited about this document distribution system being used in the School of Biological Sciences. By removing the problems of exam return to students, faculty can more easily utilize short answer and free-response questions on their exams. And by making the graded exams quickly available, students can compare their responses to the answer key and see what material they didn't understand. This reinforces the idea that the exam can be a learning tool for the students, and emphasizes that all the information and cognitive skills they learn in early classes are important to remember for later classes as well.

For full report, see **Supplementary Materials (Page 8)**.

## Future

Network & Academic Computing Services and Distribution and Document Management plan to continue developing Rapid Return, making improvements in the system to better address the needs of the UC Irvine community.

Some planned and potential updates include:

- **RSS compatibility**  
RSS feeds of EEE DropBox updates to help students keep track of the files available for them to download.
- **Email notification**  
Automated email notification to students to reduce instructor work-load.  
(Optional)
- **Color PDFs**  
Color PDF files, rather than the black-and-white files that are currently used to reduce file size.
- **Scantron compatibility**  
Scantron does not offer a product that allows grading of standard Scantron exam forms with concurrent export of exam images. DDM is developing an application and Web interface that uses Optical Mark Recognition (OMR) software to create multiple choice exam forms. When complete, the multiple choice exams can be printed on standard 8-1/2x11-inch paper rather than requiring special Scantron forms, and exam grading and image capture will occur concurrently.

## Project Team Members

DDM Team Leader, Linh Nguyen

Team members:

Michael Luong

Norm Franz

Lam Tran

EEE Rapid Return Team Leader, David Pritikin

Team Members:

Briandy Walden

Max Garrick

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## Supplementary Materials

### Analysis of Fall 06 Exam Scanning in School of Biological Sciences

Adrienne Williams, HHMI Professor Program Co-Director

Diane O'Dowd, HHMI Professor

Developmental and Cell Biology

January 17, 2007

**Rationale:** In Bio 93, our exams have free response elements since this helps the faculty assess both student knowledge and critical thinking skills. This information is important in guiding changes in teaching to improve learning outcomes. The exams are also designed to be challenging since analyzing their mistakes often helps students increase their understanding of the material. To achieve these two pedagogical aims it is necessary to grade exams accurately and distribute graded exams back to students quickly.

#### Exam format:

To achieve our first goal of having free response questions to inform faculty about learning outcomes, we chose a combination exam with 70% multiple choice and 30% free response. We favor this distribution for several reasons. First, the 3 TAs allocated to each class of 444 students, were able to complete the grading in 1 day (a total of ~ 6 hrs/TA). Topics chosen for free response questions are different on the distinct exams made for each section, allowing the faculty gain deeper insight into student understanding and misunderstandings of 60% of the topics when teaching 2 concurrent sections. Secondly, we feel that it is possible to design multiple choice questions that not only require memorization but integration and understanding of the material. In addition, since the standardized exams students will take to gain entry to professional schools are multiple choice we need to continue to prepare the students to excel in this exam format as well.

#### Exam archiving and return:

To achieve our second goal of having the student use the exam as a learning tool, it was necessary to devise a method to return the exams to the students rapidly and securely. This is because students show little motivation to carefully analyze their mistakes when they don't have easy access to their own exams. In past years we have not returned original exams because of security issues but students were encouraged to look at their own exam during office hours of faculty or TAs. However, only a small fraction of students do (generally less than 10%). Factors that contribute to this are limited viewing times, and being intimidated by having to look at their exam front of the instructor. Therefore, we teamed up with Document Scanning Services to develop a cover page for the exam that allowed production of pdf files of the graded exams linked to student name/number that were then post to a secure course dropbox. Students were able to securely download a copy of their graded exam and compare this to the annotated answer key posted on the general course website. This procedure also had two added benefits. When grading large numbers of free response questions there can be grading mistakes, the most common being errors in addition of scores. Students are now responsible for checking the math on their exam. Secondly, this eliminates the space problems associated with securely storing hard copies of original exams.

**Procedure:**

After some adjustments, the current technique for exam scanning is as follows, as instructed by Steve Carlyle in his email to the BioSci faculty on January 16:

- 1) Getting started -- Request your exam cover page from Linh Nguyen in DDMS (lvnguyen@uci.edu / x48505) by providing the following:
  - + Class ID and Description
  - + Exam Title
  - + List of exam version (A-A, A-B, etc...) for each class
  - + Date of the exam
  - + Anticipated date the exams will be ready for pickup
  - + Linh will email you the cover page(s) in PDF format
  - + Print the cover page PDF and use as the first page of each exam
  
- 2) Scanning by Distribution and Document Management (DDM) -- When exams are graded, call e-Docs staff (x44147). e-Docs staff will:
  - + Pick up the exams from the departmental office
  - + Scan the exams and validate the student ID's.
  - + Email you with a link to a secure web site which contains one or more compressed files (ZIP) containing the individual student exams in PDF format.
  - + Store the original paper exams until three months after the course has concluded and then shred the exams unless you ask for the exams back.
  
- 3) Distribution to students by using EEE DropBox
  - + Create an EEE DropBox with an "AssignmentReturn" folder for your class  
Instructions at <http://eee.uci.edu/help/dropbox/how-to/#newdropbox>
  - + Use the "Upload Zip" option to transfer ZIP files into EEE  
Instructions at <http://eee.uci.edu/help/dropbox/how-to/#filetostudent>
  - + Verify the files uploaded correctly
  - + Files are now available to students on their MyEEE page

Steve Carlyle lists the cost as \$0.05 per page, which includes pickup of the exams, prepping the exams for scanning (removing staples, straightening paper edges, etc.), scanning of the exams, quality control (correcting ID errors), providing images in PDF files for upload to EEE dropboxes, secure storage of all PDFs and original exams up to 3 months from the last date of the quarter, and secure shredding.

**Results:**

**Scanning of midterm exams**

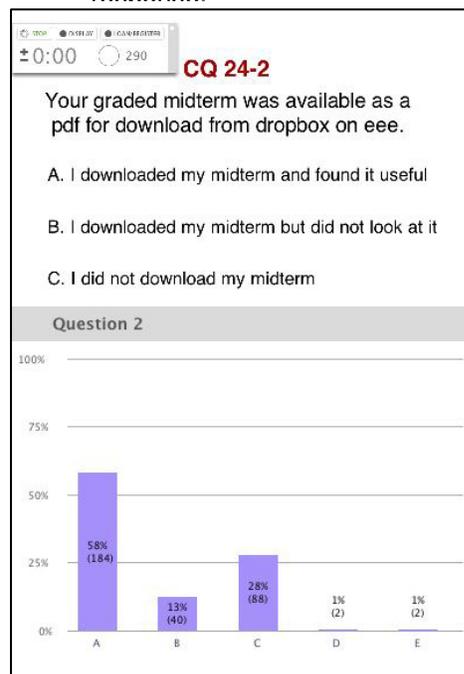
The first trial of the scanning program was limited to midterms for Bio 93, Sections A and B. Each section had a different exam and there were two different versions of each exam (where the questions were the same but the order of questions/and answers was altered). Both midterms were given on Wednesday, October 25, 2006 (884 students). Four graduate student TAs, and 1 discussion leader completed grading of the exams and entering scores into eee gradebook by Friday morning, October 27. Document services picked up the exams on Tuesday, October 31, and the PDF files were ready for download on the afternoon of Wednesday,

November 1. The faculty (O’Dowd) downloaded the zip files, created an EEE dropbox for them, and uploaded the files. The process took less than 30 minutes.

**Student response to scanning of midterm exams**

On November 17th, two weeks after the midterms were available for download, the students in Bio 93 were asked during lecture to give feedback on the usefulness of having their exams available online. Two questions were presented to both sections of lecture in the form of clicker questions, a format the students use every lecture. Figure 1 shows a sample of the clicker question and the response histogram of the students.

Figure 1: Clicker question and response.



“Your graded midterm was available as a pdf for download from dropbox on eee.”

- A. I downloaded my midterm and found it useful (54% Section A; 58% Section B)
- B. I downloaded my midterm but did not look at it (15% Section A; 13% Section B)
- C. I did not download my midterm (29% SectionA; 28% Section B)

“Would you like the final available as a pdf?”

- A. Yes (87% Section A; 90% Section B)
- B. No (1% Section A; 1% Section B)
- C. I don’t care (11% Section A; 8% Section B)

We compared these data with those from EEE, which recorded the following number of downloads by unique UCInet IDs

Exams	Number Dowloaded	Percent of Class
Bio 93 O’Dowd/Warrior midterms	542	61%

Data provided by David Pritikin, EEE

**Scanning of final exams**

Based on the positive student attitude to the results of the midterm scan, the program was expanded to include two more faculty teams for the final exam. These faculty were Rahul Warrior (Bio 93 – Sections A and B, 884 students), Lee Bardwell (Bio 97 – Sections C and D, 604 students), and Carrie Brachmann (Bio 97 – Sections A and B, 884 students). In addition to scanning the exam booklets, the Bio 93 course also scanned in the multiple-choice scantron forms as separate PDF files. All exams were given during finals week (December 4-8, 2006). After grading the exams, the scores were recorded and the booklets (and scantron forms for Bio

93) were sent for scanning. Scanning of the booklets was again completed in less than 48 hours, the scantron forms took 24 hours longer to correct student errors with bubbling in Student IDs.

All four faculty members reported satisfaction with the program. They were able to obtain the PDF cover sheets from Document Services in a timely manner before the exam, and Steve Carlyle of BioSci Computing was quick to pick up the exams for delivery after they were graded.

Student downloads of the final exams are given below:

Exams	Number Downloaded	Percent of Class
Bio 93 O’Dowd/Warrior Final Exams	260	29%
Bio 97 Yi/Bardwell Final Exams	148	25%
Bio 97 Edinger/Brachmann Final Exams	393	45%

Data provided by David Pritikin, EEE

### **Faculty Analysis:**

Benefits given by the faculty include:

1. All students have access to their exam without anyone holding extra office hours
2. Students are much more likely to look at their exam and analyze their mistakes
3. TAs don’t need to grade each exam multiple times to reduce grading errors – Students can be responsible for checking the math on their exam
4. More grading errors are caught
5. I can post an exam key with the rationale for the questions, so students can learn from their mistakes
6. I can have short-answer questions on the exam without the worry of student cheating on re-grades
7. I no longer have boxes of old exams cluttering my office
8. Exams can be archived indefinitely in electronic form
9. I get many fewer emails about “how/where/when do I pick up my exam?”

### Concerns by faculty include;

1. Can this be expanded so multiple-choice exams can be graded by scanning the booklet?  
Response: This is theoretically possible, but has not yet been tried

2. How many students are actually downloading their exams?

Response: These data can be obtained by contacting David Pritikin ([eee@uci.edu](mailto:eee@uci.edu)), and he is looking into making this a feature that faculty can access on their own.

3. Can Document Services deal with last-minute requests for cover sheets?

Response: This remains to be seen as more faculty adopt the program. A program in EEE that would automatically generate a cover page with the appropriate bar coding would be ideal.

4. Can EEE quickly deal with faculty having difficulty uploading large files to dropboxes?

I had to email David Pritikin with problems when trying to upload from home.

Response: The pilot run found a number of weaknesses in the system, such as drop box size, and uploading large zip files from home. The problems found in the pilot have been corrected or addressed at this point.

5. Will the cost be a drain on the department?

Response: If it becomes necessary to reduce the costs of this program, the number of pages scanned by each course can be reduced. This would, of course, concurrently reduce the benefit to the students.

Idea	Downside
Only scan midterm, since students are most interested in improving their grade for the next exam	<ul style="list-style-type: none"> <li>○ Does not emphasize value of information for future classes,</li> <li>○ Does not allow students to catch grading errors on final exam</li> </ul>
Remove multiple choice section, only scan short answer section	<ul style="list-style-type: none"> <li>○ Requires TA time to take apart exams before scanning</li> <li>○ Makes student analysis of their multiple choice section more difficult</li> </ul>

**Conclusion:** We are excited about this document distribution system being used in the School of Biological Sciences. By removing the problems of exam return to students, faculty can more easily utilize short answer and free-response questions on their exams. And by making the graded exams quickly available, students can compare their responses to the answer key and see what material they didn't understand. This reinforces the idea that the exam can be a learning tool for the students, and emphasizes that all the information and cognitive skills they learn in early classes are important to remember for later classes as well.

**NOTE:** Each question included in the "concerns by faculty" section above has been addressed as follows:

Concerns by faculty include;

1. Can this be expanded so multiple-choice exams can be graded by scanning the booklet?

Response: This is theoretically possible, but has not yet been tried **OMR technology is being used to develop a multiple choice response form that can be scanned and graded concurrently.**

2. How many students are actually downloading their exams?

Response: These data can be obtained by contacting David Pritikin ([eee@uci.edu](mailto:eee@uci.edu)), and he is looking into making this a feature that faculty can access on their own. **DropBox interface has been developed to allow instructors direct access to such data.**

3. Can Document Services deal with last-minute requests for cover sheets?

Response: This remains to be seen as more faculty adopt the program. A program in EEE that would automatically generate a cover page with the appropriate bar coding would be ideal. **The Web form is now available, and can be generated by the instructor anytime from any internet accessible computer.**

4. Can EEE quickly deal with faculty having difficulty uploading large files to dropboxes? I had to email David Pritikin with problems when trying to upload from home.

Response: The pilot run found a number of weaknesses in the system, such as drop box size, and uploading large zip files from home. The problems found in the pilot have

been corrected or addressed at this point. **Web information has been expanded and individual assistance is provided by EEE and DDM support staff.**

5. Will the cost be a drain on the department?

Response: If it becomes necessary to reduce the costs of this program, the number of pages scanned by each course can be reduced. This would, of course, concurrently reduce the benefit to the students. **This issue is being addressed within academic departments. Since the Rapid Return service eliminates many miscellaneous expenses previously incurred at the department level such as photocopying, record storage, and shredding expense, most departments have authorized instructors to use the Rapid Return service.**

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