

# Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students<sup>1</sup>

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By  
Steven C. Myers  
Associate Professor  
Department of Economics  
The University of Akron  
Akron, OH 44303  
(330) 972-7421  
[myers@uakron.edu](mailto:myers@uakron.edu)  
<http://gozips.uakron.edu/~myers>

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## Introduction:

This paper describes a class designed to scaffold students in computer skills and beginning economic literacy tools and to provide for the creation of an electronic portfolio for each student. The course is named *Computer Skills for Economic Analysis*, a title chosen for its similarity to the lead book required of the students (Judge(2001)). This is a course designed to establish a minimum baseline in computer usage among all economic majors, minors and other interested students. To be an economic analyst requires strong computer and communication skills. This course establishes a number of minimum competencies that students must have before entering the world of work. It is designed as the first course to follow principles of economics although many of the principles and assignments could be integrated into a traditional introductory course. A key part of the course is the creation of web pages by the student providing the foundation of an electronic portfolio that will follow the student throughout their undergraduate career and into the world of work. Examples of the electronic student portfolios are included.

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<sup>1</sup> This paper was previously presented at Teaching Economics: Instruction and Classroom Based Research, 15<sup>th</sup> Annual Conference, Robert Morris University, February 13, 2004. The author is grateful to Mike Nelson and participants at that conference for advice and recommendations.

### Review of the Literature on Assessment Strategies

The curriculum revisions in the undergraduate degrees offered by the university depends on this required course as well as a summative senior project and summative assessment of artifacts that will be added to the portfolio over the student's career. The Instructional design and content choice of these courses are critical. McKeechie (2002) tells us that portfolios "...demonstrate the progress that has been made, ... the students best work, or better yet, the student's descriptions of how the work helped his or her development. (p. 92)" He comments that he often finds evidence of learning he would have otherwise missed, but warns that "(u)nless you provide instruction on how to construct a portfolio and describe the criteria you will use in evaluating it, assessing reliably will be difficult. (p. 94)"

Portfolios have a long history in educational assessment. More recently the new electronic portfolio has emerged as a tool for assessment. In the educational technology press there are reviews by Batson (2002), Ittelson (2001), NLI (2004), Barrett (2004), and Cambridge (2001). Each of these references have extensive web links associated with them to explore and learn more. My use of the term electronic portfolio is limited to one created by the students according to a broad guideline and with specific requirements for completion that will represent a repository of a students work during their career (formative assessment) and as a final representation of their abilities upon application for graduation (summative assessment). Further, I mean by electronic portfolio a web page running on an intranet in the department of economics at our university and at the students initiative may reside on the world wide web or Internet.

Chickering and Gamson (1987) provide a list of seven principles for good practice in undergraduate education. These represent one rather broad way to evaluate one's instructional and program design. This course, designed to scaffold computer skills and create an electronic portfolio, seems to positively address each one at least in part. Central is their principle of *(i) using active learning techniques*. This course is very much student centered and *(ii) emphasizes time on task*. Students learn that to achieve the *(iii) high expectations* of the course, they must

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

master the computer skills before producing a product on any of the modules assigned in class that will be graded for their economic content. The course has a high level of *(iv) contact between students and faculty*, and because of the active and cooperative nature of the tasks including the emergence of student experts *(v) develops reciprocity and cooperation among students*. As explained below, *(vi) different talents and ways of learning are respected*, while *(vii) feedback* occurs on a variety of levels most of which is immediate.

The course is first and foremost a course in economics. Not unlike econometrics which can stray far into mathematics and statistics leaving the student to only guess at the links to doing economics, this course can, without proper direction and care, drift into the art of using a computer. To keep the course centered an instructional design requires every unit of study to have an economic application. These modules consist of computer principles that must be mastered and the use of each skill has some level of career or economic content.<sup>2</sup> The portfolio design and presentation pushes the expectation on the part of the student to update and maintain it throughout the student's career. This is reinforced by the new curriculum requirements to be assessed on both a final project and their portfolio. Thus, a balance is created between the assessment of the student in the course and the student in their major. For departments of economics in schools of business and others needing to provide accrediting agencies with proof of ongoing assessment this course and or the use of electronic portfolios may become a critical component of their assessment strategy.

For example, measures of direct program assessment recommended by AACSB (2004) may “include evaluation of student portfolios, capstone projects, and examinations (e.g., ETS field tests), as well as use of assessment centers.” However, they go on to point out that “(t)o meet AACSB requirements, assessment programs need to generate data that provide a basis to evaluate ALL of the program's learning objectives. While a carefully designed capstone project or

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<sup>2</sup> While the modules on career and educational objectives and the creation of a resume are not topics of economics, they are writing about their own economic being.

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

an assessment center may be capable of this, most schools will find that they need to use multiple methods to generate the breadth of data that is needed. (from web page)”

In economics an assessment strategy is laid out well in the proficiencies illustrated by Hansen (2001). Our department has engaged in a multi-step process to revise our curriculum. The first step was to revise the existing courses and requirements in our department. That process led to the creation of the computer course described in this paper. The second step being planned and in some cases already implemented involves the content of each course and the appropriate assessment strategy for judging the value of the major. The Hansen proficiencies are implemented in a manner similar to Carlson (2002). In our case each faculty was asked to show how what they already did in their courses matched the proficiencies and were asked to try and see where their course might be individually modified to reflect these. Students will be expected to discern what they have done in each class might be an artifact in their electronic portfolio and will then post that artifact and write a reflection statement on it for review by the student’s advisor and as necessary other members of the faculty. Each of the Hansen proficiencies must be matched with an artifact from the student. Those proficiencies are (1) Access to existing knowledge, (2) Display command of existing knowledge, (3) Interpret existing knowledge, (4) Interpret and manipulate economic data, (5) Apply existing knowledge, and (6) Create new knowledge. Only the last is prescribed to be the output of the senior project from the capstone course. In the course described in this paper, much of the expectations in (1), (2) and (4) are being met.

The course is also being taught in a computer classroom where each student has access to a computer and all the necessary software. While students may use the classroom outside of class, for many tasks they use their own at home or if mobile from any point on our wireless campus. The experience in the computer classroom is critical to the design of the course and the attainment of the objectives. Becker (2003) reflects the value by saying “Bill Greene and I argue that we can increase the attractiveness and meaningfulness of our quantitative methods courses

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

by getting students into computer labs for hands-on activities with data associated with the headlines students read in newspapers, hear and see on TV, or experience on the Internet.” In this course the students are very much hands-on and are drawing down real economic data, searching the economic literature and investigating economic phenomenon all from their terminals and sometimes in rather involved close cooperation with the other students in class.

Finally, Walstad (2001) tells us “Assessing the economics major is a more difficult challenge than assessing student performance in a particular economics course.... Assessment using student portfolios offer a solution for evaluating whether a student has the attributes or proficiencies of an economic major (and) (t)hose students with difficulties would be given time to prepare new items or revise previous work.” While deadlines do exist in this course, students know they can revise up to the last day of the course for summative assessment of the portfolio (for the course) and further can revise up to graduation for summative assessment of their major. The three hallmarks of assessment using portfolios are then (1) within the course, (2) within the students own major, and in a more macro view, an (2) overall assessment of the program of study. In this course, and in our programmatic review we feel we have met this challenge and have formed an assessment strategy which will give value to both the students and the faculty.

### **Motivation for this course**

In 2000 the Department of Economics at The University of Akron revised its curriculum at the undergraduate level and created a need for certain specialized courses and processes. This paper describes the first of the new courses designed to provide computer skill scaffolding under students while tying each skill to the economic literacy needs of an undergraduate economics major. On the topic of scaffolding, it is acknowledged by our faculty that (1) students can not function adequately without solid computer skills, (2) students are initially endowed with different levels of skills, (3) far too much class time is needed to provide scaffolding in each upper division class, (4) professors often will choose not to require or expect a skill if they do not have the time

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

to provide such scaffolding, and (5) that much opportunity for learning is missed due to lack of skill. From an assessment, view faculty need to pay adequate attention to achievement of certain expectations for graduates of our program (e.g., compliance with the Hansen proficiencies). By placing this course in the curriculum, subsequent courses have more time to meet their requirements such as the ability to interpret and manipulate economic data, to apply existing knowledge, and create new knowledge. The course addresses the issue of both formative and summative assessment of the undergraduate major and provides a different kind of scaffolding for the assessment of the department through the use of the electronic portfolios created by the students in this course.<sup>3</sup> As the student progresses certain artifacts from other classes will be placed in their electronic portfolios such as research papers and presentations.

The student created electronic portfolio begins as a course portfolio, becomes a comprehensive student portfolio through out the undergraduate career, and finally emerges as a professional portfolio displaying the student and their abilities to prospective employers. Students are required to put their portfolios on the local intranet and some of the students are proud enough of their portfolios to place a copy on the Intranet on their student accounts. While the course is offered for undergraduates, some of our graduate students have created their own portfolios because they see the immediate value for them.

### **Overview of the course:**

The course requires that a student achieve a number of minimum competencies in computer tool use. The student demonstrates meeting the competencies by completing an economic analysis using the appropriate computer tools. Assessment of the student's level of competency in each

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<sup>3</sup> As novel as this might be in economics, this was not the first time our students have created portfolios. While we did not call them electronic portfolios, my colleagues Richard Stratton, Fred Carr and myself taught in 1996 and 1997 four courses for K-12 teachers that had them create lessons in economics to integrate into their classes using multimedia and the Internet with their 'product' displayed in what I now call electronic portfolios. Some of those presentations still exist via my web page <http://GoZips.uakron.edu/~myers/scholarship>.

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

of nine modules occurs. The student is asked to demonstrate the ability to communicate economic analysis, not just the demonstration of the computer methods. In fact, this course allows the student to learn a variety of computer skills, but does not teach those skills in depth. Rather, the application of those tools to economic analysis is the overarching goal of the class. Students will use economic concepts and tools from the prerequisite principles class to conduct the economic analysis.

Each competency or module requires the student to learn and communicate economic knowledge using a computer skill. They present formally the economic analysis using the newly qualified computing tool(s). The instructor and the TA for the course then independently evaluates student work for each module and discuss the appropriate score and feedback. The student is assessed on each module according to whether they demonstrate (1) competency in using the computer tool, (2) skill in knowing and using the resources needed to succeed in the module, and (3) an appropriate level of knowledge of economic facts and economic analysis. Students are reminded often that they are economists first and computer programmers last.<sup>4</sup> The in-class assessment rubric is appended to this paper.

As each of the nine modules begin, students are presented with a short in-class demonstration and are provided with supportive materials supplied through the course management system. Each assignment is presented in a visual, an aural and a reading and writing style.<sup>5</sup> Students then use that material and begin to do the assignment the same day as assigned. They are monitored during class and given access to the lab outside of class to actually do the problem. The learning is highly kinesthetic, active and collaborative as students seek help from each other as they progress through the class. In fact, very quickly student experts emerge and begin helpful collaborations.

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<sup>4</sup> This is a corollary of a phrase I use in my graduate econometrics courses. I remind the students often that they are economists first, econometricians second and computer programmers last. Trouble in analysis and reasoning always follows when we get these out of order.

<sup>5</sup> The learning style preferences are part of the VARK inventory, Visual, Aural, Read-write and Kinesthetic as developed by Neil Fleming (see <http://www.vark-learn.com>).

**Software for this course:**

The software to which the students are exposed to in this course include MS Office (Word, Excel, PowerPoint, Access), Internet Explorer, Netscape Navigator and Composer, SAS, WS-ftp, and Adobe Acrobat. Additionally, access to the extensive online resources of the UA library and Ohio Link, the statewide electronic library, and discipline specific resources such as ECONLit, Resources for Economists, and many government and private Internet databases are explored.

The course is taught in a computer lab designed for teaching. Each student sits at a computer that is available to the professor by the use of SMART Synchroneyes, a product that allows the professor to control and even display each students screen to the class. Thus, as questions arise they are handled in view of the class who may stop and watch or continue with their own work. With SMART Synchroneyes I can block the students use of their computer and focus their attention forward as necessary. I can bring their image on their monitor to the screen in front as they or I demonstrate or fix the problem. The classroom-laboratory environment has proven invaluable to the success of the course, but is probably not necessary for success at other schools.

The technological enhanced classroom includes one computer per student, a SMART Symposium presentation panel, projection and sound support. A SMART Symposium allows the professor to write with a pen on a panel, not unlike writing on a monitor, and have the writing and annotations both projected and saved. The SMART Symposium takes place of both the presentation station (computer and projector) and the whiteboard. Indeed the interactive whiteboard that is a part of the SMART Notebook software is a better than perfect replacement for the static on-wall whiteboard in the classroom. Each student computer is tied to the professor computer in the LAN by SMART Synchroneyes which allows the professor to monitor all student's computers, to take control of a computer to fix a problem or illustrate a solution, to allow for



## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

broadcast to each student's computer and to be able to choose any computer for projection to the entire class. Shared server space is utilized for the students' work as well as their submissions of each assignment. A naming convention is adopted that allows for the easier management of the many files submitted by the various students. This convention begins every file with "xxx\_yyy\_" where "xxx" represents the student's UAnetID and "yyy" represents the named assignment such as "module1." Revisions are marked with trailing letters so that a b in Myers\_module1\_careergoals\_b.doc would indicate a second and more recent submission.

### **Instructional Design:**

The design of the course is a modified mastery learning design emphasizing active learning and cooperative learning. The role of the professor and teaching assistant is as "a guide on the side and not as the sage on the stage." Mondays are the typical day in which the professor introduces and demonstrates the skills expected for each module. Wednesdays and Fridays are more strictly laboratory time. Students may work at the lab or at home and a distance-learning version of this course is envisioned in the future. Students have initial deadlines for points, but may work to improve their projects up to the last day of classes. This course is heavily learned centered where student are actively engaged in the construction of their portfolios and assignments. The students collaborate with each other sharing both problems and successes. The course is designed on a time line for the introduction of each of the nine modules (assignments), but the students may work at their own pace to master the computer skill required of the modules.

Deliverables in this course include a resume, a personal statement of educational and career objectives (after discussions with the Arts and Sciences career officers), at least one economic essay with images (and captions), graphics, tables and columns. Additionally, the student writes a small research paper concentrating on form and content and use spreadsheets to hold and manipulate downloaded data and to do certain calculations such as present value. They make a PowerPoint presentation on an economic concept, search the specific economic literature and

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

learn principles to search the World Wide Web. They use SAS<sup>6</sup> to input and manipulate data and to create summaries of data and to learn the basics of running a regression and the reporting of the results. And most importantly they create a series of web pages that organizes the above artifacts into an electronic portfolio. This portfolio is published on the university Intranet and/or Internet for the student's reference and for future students guidance and assessment at <http://gozips.uakron.edu/~myers/E226>. Some screen shots of a few of the portfolios are attached for your review as well at the end of this paper.

The nine modules used in Fall 2003 include:

1. A personal statement of your educational and career objectives. Computer skill was simple MS Word and the ability to save and email the document.
2. An economic essay on something that makes the student curious. MS Word requirements for form were very exacting requiring for example both a picture and a table or chart with caption, an index and certain standards for appearance.
3. A draft of their resume and the writing of the first three modules to a web page using Netscape Composer. Outside expertise from the Arts and Sciences career center was used to present feedback on student's career choices and the construction of the portfolio.
4. A research paper assigned after feedback on the economic essay and due towards the end of the term. The next three modules were part of the final produced research paper.
5. Finding data, downloading to Excel and manipulating the data for suitable inclusion in a research paper. Extensive instruction and demonstration of online datasets and other useful websites was covered including how to find data.
6. Construction of an annotated bibliography. This also followed presentations on how to find literature in the discipline, including EconLit and a formal presentation from the

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<sup>6</sup> SAS Institute, [www.sas.com](http://www.sas.com).

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

- University Library on both the physical and electronic collection locally and nationally. A highlight was presentation on Ohio Link, one of the nations premier electronic libraries.
7. A PowerPoint presentation on a topic of their choosing or on the Voluntary Content Standards as presented by the Foundations for Teaching Economics website.
  8. A survey conducted in class and required to be replicated outside of class on politics and economic literacy. Students learned to conduct the survey, code the data and use SAS to produce useful results that were then to be written up in a professional manner.
  9. A complex task of finding multi-source data, downloading and merging into a useful dataset by again using SAS to run the most primitive of multivariate analysis and to write up the results in a professional manner.

All students did rather well with the first seven modules, but the latter two did cause more difficulty. Nevertheless, most students did module 8 and at least tried module 9. Both of the latter modules are quite challenging and are appended to this paper for your use if you find them useful for your course objectives.

### **Assessment:**

For all the bugs of a first time offering, the students gained great value out of the experience and in the words of McKeachie, I found evidence of learning that I did not suspect. After the fifth week and the successful writing of the web pages that would become the student portfolio a student responded to a typical query of “how is it going?” with “if the course ended right now, this would be the most useful course I have taken.”

As this paper discusses a course that is a work in progress, please do not hesitate to contact the author for more information or to offer ideas. I intend to try a variety of different things including more use of classroom assessment techniques (CATs) especially a greater use of the minute

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

paper. Informal summative assessment of the course has been very positive and the next iteration of the course is scheduled for Fall 2004.

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Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

Computer Skills for Economic Analysis – Required Files & Due Dates from Individual Modules.

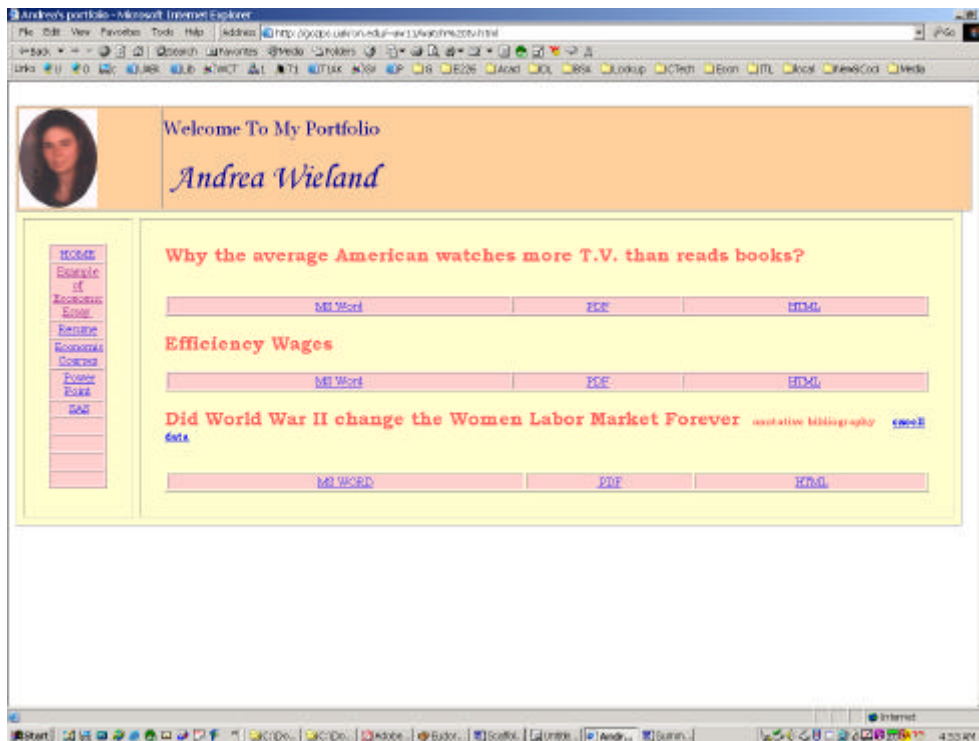
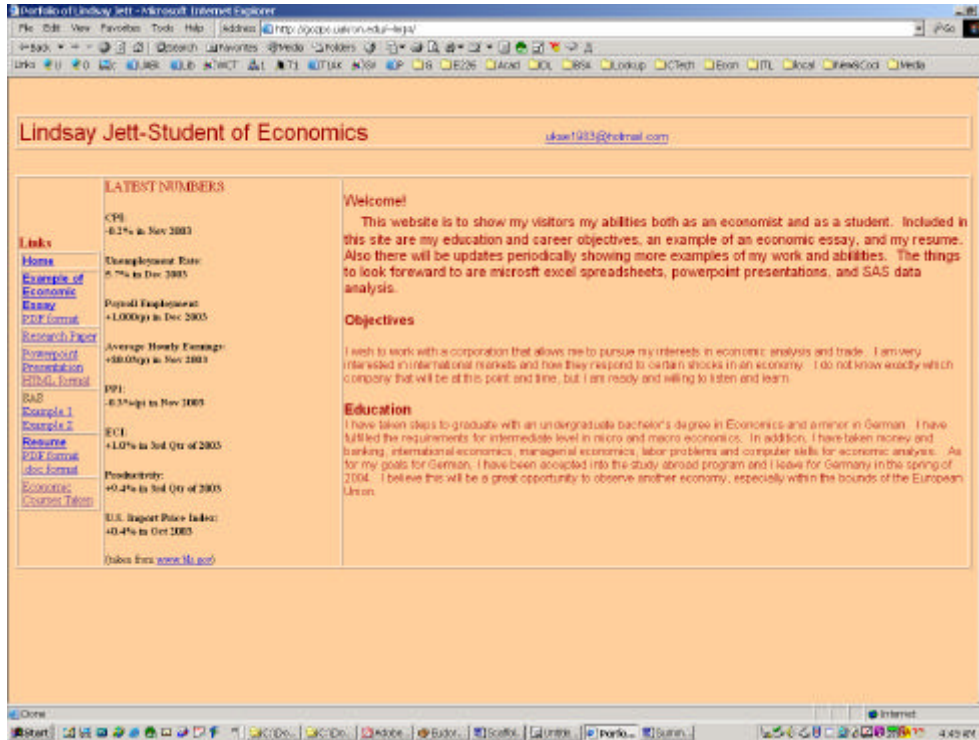
Students – Please be sure that all of the required elements are in place for our final review. Even if you missed a required due date, please make sure that by December 10, 2003 all of the files below are in your E: drive and every module is represented in your portfolio. Points assigned by due dates on the nine modules are 75% and your final portfolio review is 25% of your grade.

Module	Required files / naming convention	Due date for grade	My Checklist
1 Personal Statement of educational and Career Objectives	MS Word file UAnetID_Module1.doc	Not given	10 pts. for content 10 for form
2 Economic Essay on something Curious	UAnetID_Module2.doc	Sep. 12, 2003	10 pts. for content 10 for form
3 My Resume	Resume draft in MS word (doc) UAnetID_Module3.doc Module 1 paper in html Module 2 paper in doc, html and pdf format  All three in Netscape Composer and saved as a webpage.	First Draft Sep 19, 2003	10 pts. for content 10 for form
4 My Research Paper	UAnetID_Module4.doc  Copied and linked to portfolio	Nov 7, 2003	20 pts. for content 20 for form
5 Finding and downloading data and creating usable reports using Excel	Title and Abstract of Module 4 paper (doc) and describe data sources used.  UAnetID_Module5.doc  UAnetID_Module5.xls (worksheet of raw data and a worksheet of created graphics)	Oct 20, 2003	10 pts. for content 10 for form
6 Construction of an Annotated Bibliography	UAnetID_Module6.doc	Oct 31, 2003	10 pts. for content 10 for form
7 PowerPoint Presentation of Economic Content	UAnetID_Module7.ppt UAnetID_Module7.htm	Nov 3, 2003	10 pts. for content 10 for form
8 Using SAS to process survey data and writing up results	UAnetID_Module8.sas UAnetID_Module8.doc	Nov 24, 2003	10 for SAS pgm. 10 for survey 10 for doc file
9 Using SAS to draw conclusions from Multiple source data	UAnetID_Module9_create.sas UAnetID_Module9_analyze.sas UAnetID_Module9.doc	Dec 3, 2003	10 for create 10 for analyze 10 for doc file
Final Portfolio due	Each module must be represented in your portfolio.	All links must be finalized by Dec 11, 2003 (12:00 pm)	10 points for form and functionality per module. 90 total points.

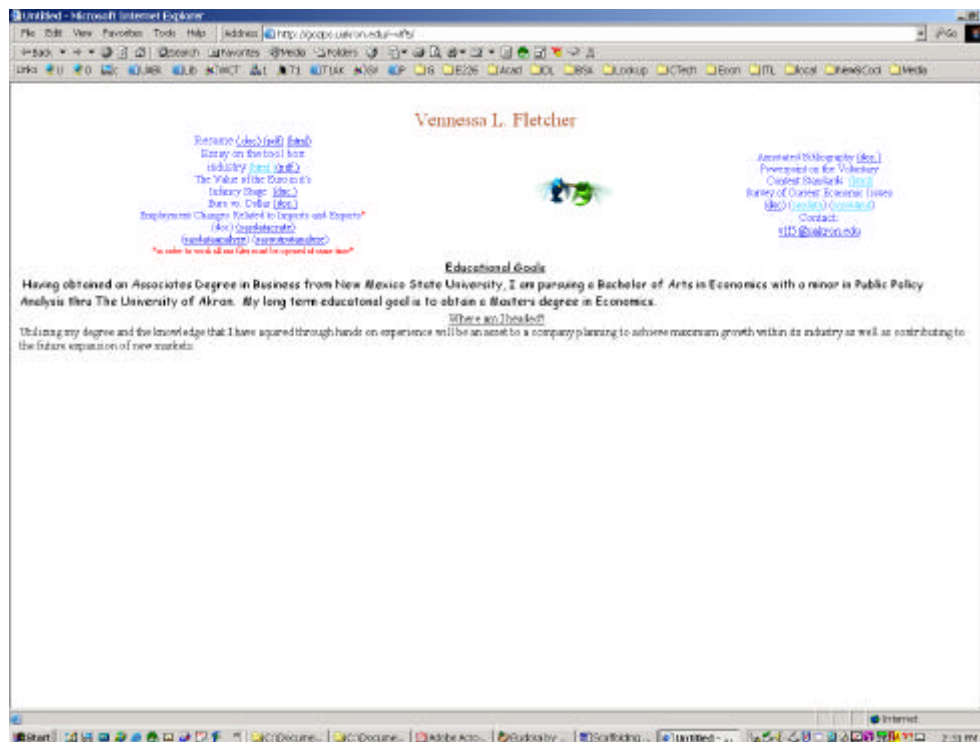
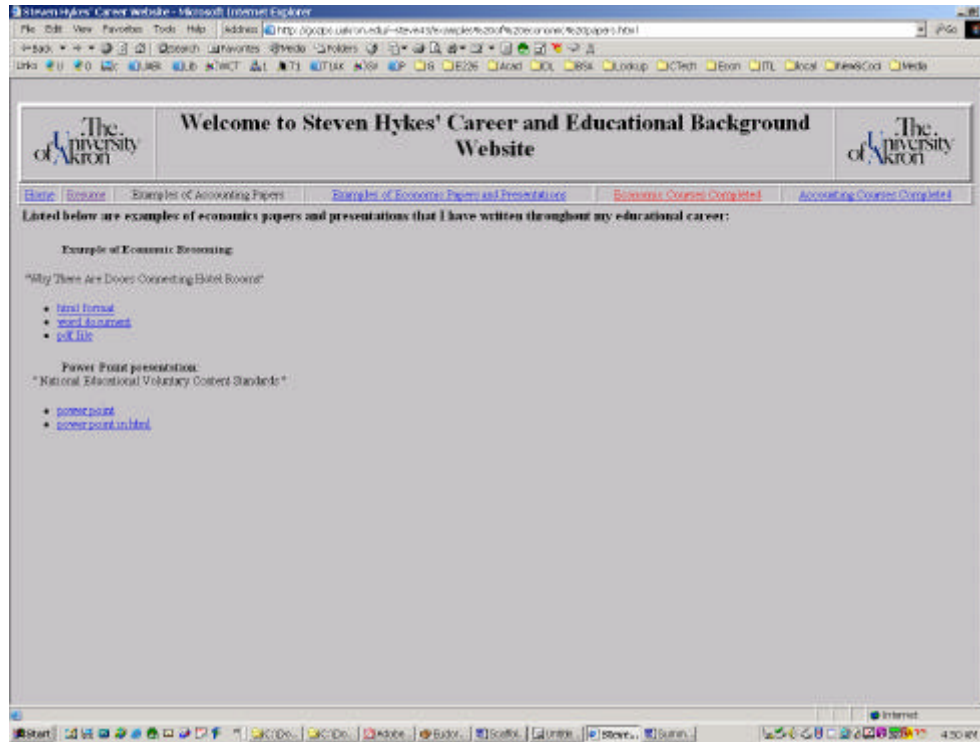
Professional Look and Feel (10) \_\_\_\_\_  
 Score on M1-M7 (160) \_\_\_\_\_  
 Score on M8-M9 (60) \_\_\_\_\_

Total Score (320) \_\_\_\_\_  
 Recommended Grade \_\_\_\_\_  
 Attendance pct. \_\_\_\_\_

# Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students



# Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students



## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

Module: 8

Title: Using SAS to process survey data and writing up the results

Short Summary: From time to time you may have to generate your own data, or at least use someone else's data that you will have to code into the computer before you can get any results. In this project you will do a short survey of at least 20 persons and report on your findings using SAS.

In class we will do a sample survey that you may extend (Option A) or use your own questions (Option B).

Objectives;

- ❑ Computer skills – Beginning level SAS Data step and Proc steps of Proc Means, Proc Print, Proc Freq and Proc Tabulate. Coding and entering survey data into a SAS data step.
- ❑ Economic skills – Ability to design a usable short survey on an economic issue or topic and to draw inferences from the data based on your economic reasoning.

Requirements and Deliverables: You are to produce results from a survey that you administer to at least 20 persons and include the coded results in a SAS program. You are to use SAS to generate results and to write up your results in a MS word document. The word document must include all summary results that you need to reveal. You are to save two files to the E disk

(1) *UAnetID\_Module8.sas*: All of the data must be included in the SAS program after a cards statement and all results that you use must be in a single SAS program that you submit. (You can include multiple data and proc steps in a single SAS program and some of the code can be commented out, but all the code you use must be included in that program.)

(2) *UAnetID\_Module8.doc*: This is a report suitable for reading by a general audience (remember to include potential employers in that audience) which has appropriate title, authorship and abstract followed by a body of text including tables. The body of the document should include an introduction section, which describes the project and the objectives of this exercise. Following that you are to write up the results as professionally as possible acknowledging that this is not a scientific survey.

Due date: Monday November 24 at 5:00 pm.

Naming conventions: The standard convention remains of naming files

*UAnetID\_ModuleX\_y.extension* where X is the module number and 'y' is sequentially '\_a', '\_b', etc to indicate revisions, and 'extension' is doc for MS word, pdf for Acrobat, xls for Excel spreadsheets, ppt for PowerPoint and html for hypertext markup language pages, sas for SAS program files, log for SAS log files and lst for SAS output files.

Discussion:

All surveys must be fairly administered, do not bias or lead your interviewees. All surveys must be anonymously administered, that is do not record the name or identifying information of the respondent. You may use personal, face-to-face or phone survey, but be sure to discuss the method of survey data collection in your write-up.

You must choose one of two options:

Option A:



## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

The survey questions and a sample SAS program are attached. You are to administer this survey to at least 20 persons who (1) have never had an economics course and (2) have not been surveyed in this experiment by you or another student.

### Option B:

You may make up your own survey. You must have at least three substantive questions such as questions 1 to 4 on the attached survey. You should include approximately five demographic questions such as questions 5 through 10 of the attached survey. You must include question 12, that is include your UAnetID for all surveys. That is each person surveyed will NOT give you their UAnetID since these are anonymous, but you are to include YOUR interview ID on each survey.

### References and Hyperlinks:

When connected to the E: drive

SAS online documentation: [E:\SAS\\_v8\\_Doc\sasdoc\sashtml\onldoc.htm](E:\SAS_v8_Doc\sasdoc\sashtml\onldoc.htm)

In the left most tab click first to 'Base SAS software', then 'SAS Procedures Guide, then click on 'Procedures' From there you should see links to each of the separate procedures that are used in the SAS sample attached.

### Assessment:

1. Self assessment: Do in the online form on WebCT.
  - a. What Have I learned?
  - b. What did I have the most difficulty with?
  - c. What else would I like to know or do with this assignment?
  - d. What question or questions do I have, that is, what is still a muddy point for me?
2. Points for this assignment:

This is a 30 point project:  
10 for the the module8\_UAnetID.sas submission,  
10 for the content and administration of the Survey including the coding of the survey variables, and  
10 points for the module8\_UAnetID.doc submission.

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

### Survey for Computer Skills in Economic Analysis

- 1) How is the economy doing?
  - 1) growing at a high pace
  - 2) slowly growing
  - 3) no growth
  - 4) contracting
  - 5) in a recession
- 2) What was the last reported growth or decline in the economy (prompt GDP growth in percentage terms)? \_\_\_\_\_ (format xx.x% or -xx.x%)
- 3) What is the last reported unemployment rate for the US economy? (format xx.x% or -xx.x%)
- 4) How do you rate George Bush's handling of the economy?
  - 1) First rate
  - 2) Good
  - 3) Neither good nor bad
  - 4) Bad
  - 5) Very bad
- 5) Are you more left leaning (Democratic) or right leaning (Republican)?
  - 1) Left
  - 2) Independent
  - 3) Right
- 6) If the presidential election were held today who would you vote for?
  - 1) George Bush
  - 2) Democratic challenger
  - 3) Other Party
  - 4) Won't vote
- 7) Current employment status
  - 1) Working full time
  - 2) Working part time
  - 3) Not working
  - 4) Out of the Labor Force
- 8) Gender
  - 1) Male
  - 2) Female
- 9) Have you lost your job due to layoff in the last two years
  - 1) Yes
  - 2) No
- 10) How often do you listen to or read news about the economy from Internet, TV and other media?
  - 1) Over 5 hours a week
  - 2) 3-4 hours a week
  - 3) 1-2 hours a week
  - 4) rarely or not at all
- 11) Are you a student in E226 this term
  - 1) Yes
  - 2) No
- 12) Interviewer only: include your UAnetID here \_\_\_\_\_

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

Module8\_survey.sas – example file for this project.

```
data work.survey;
input      howdoing GDPgrowth Urate rateBush
          leaning whovote empstatus male lostjob news
          E226student interviewer $;
/* recoding in place example*/
if female>0 then female=female-1;
/* creation of new variable */
if 6.9<=GDPgrowth<=7.5 then knowgdp='yes  ';
if GDPgrowth<6.9         then knowgdp='under';
if GDPgrowth>7.5         then knowgdp='over  ';

cards;
2      7.2      6.0      2 2 3 1 1 2 3 1 myers
2      7.2      6.0      3 2 4 1 1 2 3 1 myers
1      7.2      6.2      2 1 2 1 1 2 2 1 myers
1      7.1      6.0      3 1 4 2 2 2 3 1 myers
2      7.2      6.0      4 1 2 2 1 2 2 1 myers
2      7.0      6.0      2 2 1 2 1 2 1 1 myers
1      8.0      7.0      3 3 4 4 1 2 2 1 myers
1      7.3      6.0      3 3 2 4 1 2 1 1 myers
2      2.0      5.0      5 1 2 4 2 2 4 1 myers
2      7.2      5.9      2 3 1 4 1 2 2 1 myers
2      3.0      6.1      3 1 3 4 2 2 1 1 myers
4      -5.0     15.0     4 2 3 3 1 2 4 1 myers
2      2.8      4.0      4 3 2 3 1 2 1 1 myers
4      7.1      6.0      5 1 2 3 1 2 1 1 myers
2      5.3      2.6      2 3 1 2 2 2 2 1 myers
2      7.5      15.0     4 3 4 2 2 2 4 1 myers
2      7.2      6.0      4 1 2 4 1 2 1 1 myers
;
/* Use Proc Print to print out the results for inspection */
/* this allows us to see that what we typed in is correct. */
/* Alternatively you can double click on the file SURVEY in */
/* the WORK library and inspect the VIEWTABLE */
proc print data=work.survey; run;

/* using proc freq to show sample one-way, two-way and three_way tables
*/
proc freq data=work.survey;
tables _all_ howdoing*ratebush female*whovote*ratebush;
run;

/* using proc means to get averages as an example, but not all of these
*/
/* averages make quantitative sense. */
proc means data=work.survey;
var _all_;
run;

/* A Proc Tabulate example */
proc tabulate data=work.survey;
class howdoing rateBush leaning ;
var GDPgrowth;
table leaning*rateBush, howdoing;
run;
```

Module: 9

Title: Using SAS to Draw Conclusions from Multiple Source Data

Short Summary: In the last module you used SAS to analyze survey data, which was coded from the questionnaire and typed into SAS after a CARDS statement. You can see that this is not useful for large datasets, nor does it provide protection for the original source data. In this module you are to answer a question of your choosing that requires multiple source data to answer. The question should be something that makes you curious, but requires multiple source data to answer.

Objectives;

- ❑ Computer skills – Beginning level SAS Data step and Proc steps of Proc Means, Proc Print, Proc Freq and Proc Tabulate. Data handling skills using PROC SORT, PROC IMPORT and PROC MERGE, use of the SET statement and LIBNAME statements. Advanced skills such as PROC CORR might figure in. Do not use a regression procedure at this step; PROC REG is in the next module (possibly on this data).
- ❑ Economic skills – Ability to ask a research question, formulate a design and analyze the question using economic and common sense reasoning. Ability to put your question to the test by finding data and organizing its answer. Ability to think in a multivariate way.

Requirements and Deliverables:

Requirements: There are various parts of this Module:

- (1) You have to think of a research question, which requires multivariate analysis and data from at least three sources. This question and the 'variables' necessary must be clearly spelled out in the doc file below.
  - a. An example question might be "Is crime, especially crimes against property related to the economy?" The example in class centered on data from the BLS on Unemployment, Inflation and Crime statistics and are on WebCT for you to use.
  - b. In particular, the in class example suggested that maybe property crime rates are related to the unemployment rate and the inflation rate, but that violent crime is less likely to be influenced by a changing economy.
- (2) You must find the variables in at least three separate raw data files. Each data file may contain many variables, but each must contain a common key such as the name of a state or a year. That is if you collect multiple data on states, each data set will have 50 observations and one variable named STATE that includes the postal codes for each state. If you collect data over time then, if annual, each data set will have to contain the variable YEAR and the values of YEAR must be coded consistently, e.g., all four digits.
  - a. If you use time series data and your source data cannot be collected in the same increments (months or years) then you might want to learn about PROC EXPAND in the SAS/ETS program. ETS stands for Econometric Time Series.
- (3) Each of the three or more datasets (only one of which may be your own transcription) must be saved into your research folder for this problem.
  - a. On your F drive I recommend that you do the entire Module 9 in a folder called M9.
  - b. When you are finished you can move this entire folder to your portfolio space.
  - c. Do not change or edit the raw source data after you have verified its accuracy. You are to read that source data into SAS and change and edit there as needed.
- (4) You are to use PROC IMPORT to read your source data and create a member in your WORK library. You are advised to use the IMPORT wizard and use it to save the code. The code from each of your three or more data sets can be copied into a single SAS

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

- program to read in the data from all three (or more datasets) in the future sequentially. Name this file *UAnetID\_Module9\_create.sas* and build on it for the rest of the project.
- (5) Each dataset will have a key variable. For the rest of this module write up I will assume that is the variable YR (for year). Use PROC SORT to sort each dataset on the key, YR.
  - (6) Use a combination of SET and MERGE statements to merge the three or more datasets together. SET X (where XY and Z are dataset names) reads a SAS dataset. SET X Y will read dataset X then dataset Y, appending one to the other. MERGE X Y Z; BY YR; will read each SAS dataset and combine them by YR.
    - a. These statements should appear after a DATA statement, such as DATA M9.XYZ; where XYZ is the new merged dataset name.
    - b. Before the DATA statement you must have defined M9 as a LIBNAME
      - i. Example LIBNAME M9 'F:\myfolderspace';
      - ii. You will have to change this link and all the other specific references before moving to the portfolio space.
    - c. A dataset illustrating all this is called *crime\_example.sas* and is on WebCT for you to examine. It is also appended to this module.
  - (7) Now that you have the DATA step to create merged data you may include other manipulations in that dataset. This is where you might create new variables such as AFTER a variable that is 1 after an event and 0 before the event.
    - a. Example

```
AFTER=0; /* initially setting everyone at the before condition */
IF YR>1975 then AFTER=1; /* resets AFTER to the after condition for some cases */
```
  - (8) You can now process the data to your hearts content by reading in the newly merged SAS dataset using only a SET M9.XYZ; statement in place of the PROC IMPORT and CARDS or other input commands.
    - a. Example

```
DATA work.xyz;
SET M9.XYZ;
Or
PROC PRINT data=M9.XYZ;
```
    - b. All of your SAS statements and PROCs for analysis should be in a separate file *UAnetID\_Module9\_analyze.sas*
    - c. *I have included on WebCT two files *crime\_procs.sas* and *crime\_graphs.sas* which I use to analyze the data created in *crime\_example.sas*.*
  - (9) Do a write up of your question, data and analysis including tables or charts in *UAnetID\_Module9.doc*. This file must be linked to your portfolio.

You are to save three files to the E disk

- (1) *UAnetID\_Module9\_create.sas*
- (2) *UAnetID\_Module9\_analyze.sas*
- (3) *UAnetID\_Module9.doc*: This is a report suitable for reading by a general audience (remember to include potential employers in that audience) which has appropriate title, authorship and abstract followed by a body of text including tables. The body of the document should include an introduction section, which describes the project and the objectives of this exercise. Describe and give proper references to sources and include professionally organized tables. Describe your economic reasoning as to the answer to your question posed and present your data evidence in a clear, readable and professional manner. Please explain your use of SAS briefly, but completely enough that someone reading your report will know you are competent in SAS.

Note: The third file *UAnetID\_Module9.doc* must be linked to your portfolio.

Due date: Wednesday December 3 at 11:59 PM.

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

Naming conventions: The standard convention remains of naming files UAnetID\_ModuleX\_y.extension where X is the module number and 'y' is sequentially 'a', 'b', etc to indicate revisions, and 'extension' is doc for MS word, pdf for Acrobat, xls for Excel spreadsheets, ppt for PowerPoint and html for hypertext markup language pages, sas for SAS program files, log for SAS log files and lst for SAS output files.

Discussion:

References and Hyperlinks:

- When connected to the E: drive the SAS online documentation:  
[E:\SAS\\_v8\\_Doc\sasdoc\sashtml\onldoc.htm](E:\SAS_v8_Doc\sasdoc\sashtml\onldoc.htm)
- In the left most tab click first to '*Base SAS software*', then '*SAS Procedures Guide*', then click on '*Procedures*'. From there you should see links to each of the separate procedures that are used in the SAS sample attached. You might want to pay particular attention to PROC IMPORT. If you use time-series you might want to check in the SAS/ETS documentation.

Assessment:

3. Self assessment: Do in the online form on WebCT.
  - a. What Have I learned?
  - b. What did I have the most difficulty with?
  - c. What else would I like to know or do with this assignment?
  - d. What question or questions do I have, that is, what is still a muddy point for me?
4. Points for this assignment:

This is a 30 point project:

10 points for the *UAnetID\_Module9\_create.sas* submission,

10 points for the *UAnetID\_Module9\_create.sas* submission,

10 points for the *UAnetID\_Module9.doc* submission.

```
/* Crime_example.sas – a program to import raw data and merge the data into one dataset */
/* some data manipulation is required since two of the databases are monthly data and the */
/* crime statistics are annual. */
```

```
PROC IMPORT OUT= WORK.urate
            DATAFILE= "C:\Documents and
Settings\myers\Desktop\WEB_COURS
ES\E226_Computer_Skills\M9\urate6001.txt"
            DBMS=DLM REPLACE;
            DELIMITER='2C'x;
            GETNAMES=YES;
            DATAROW=2;
```

```
RUN;
```

```
PROC IMPORT OUT= WORK.Inflation
            DATAFILE= "C:\Documents and
Settings\myers\Desktop\WEB_COURS
ES\E226_Computer_Skills\M9\CPI_6003.txt"
            DBMS=DLM REPLACE;
            DELIMITER='2C'x;
            GETNAMES=YES;
            DATAROW=2;
```

```
RUN;
```

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

```
PROC IMPORT OUT= WORK.crime
            DATAFILE= "C:\Documents and
Settings\myers\Desktop\WEB_COURS
ES\E226_Computer_Skills\M9\CrimeStatebyState.xls"
            DBMS=EXCEL2000 REPLACE;
            RANGE="Raw_Data_for_SAS$";
            GETNAMES=YES;
RUN;
/*
Crime Statistics http://www.ojp.usdoj.gov/bjs
Reported crime in United States-Total
Actual number of crimes and rates as crimes per 100,000 population
Sources: FBI, Uniform Crime Reports, prepared by the National Archive
of Criminal Justice Data
*/

proc sort data=work.crime; by year; run;

data work.urate;
set work.urate;
drop jan feb mar apr may jun jul aug sep oct nov dec;
urate=mean(of jan feb mar apr may jun jul aug sep oct nov dec);
urate=urate/100;
run;

data work.inflation;
set work.inflation;
drop jan feb mar apr may jun jul aug sep oct nov dec;
cpi=mean(of jan feb mar apr may jun jul aug sep oct nov dec);
inf_rate=(cpi-lag(cpi))/lag(cpi);
run;

proc sort data=work.urate; by year; run;

proc sort data=work.inflation; by year; run;

libname m9 'C:\Documents and
Settings\myers\Desktop\WEB_COURSES\E226_Computer_Skills\M9';

data m9.crime_exp;
merge crime urate inflation; by year;

run;

/* crime_procs.sas – a sas datafile for analyzing the merged data from above */
libname m9 'C:\Documents and
Settings\myers\Desktop\WEB_COURSES\E226_Computer_Skills\M9';
data work.crime2;
set m9.crime_exp;

run;
proc freq data=work.crime2;
tables inf_rate urate property_rate violent_rate;
run;
```

## Scaffolding Computer Skills and Creating Electronic Portfolios for the Assessment of Economic Students

```
proc means data=work.crime2;
run;
proc corr data=work.crime2;
var inf_rate urate violent_rate property_rate;
run;
proc reg data=work.crime2;
model property_rate = urate inf_rate;
model property_rate = urate inf_rate year ;
model property_rate = urate inf_rate population year ;
run;
```