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11-2011

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### Recommended Citation

Beith, Linda L.; White, Stephen; and Laramie, Gregory, "Using an Open Software System (Sakai) to Develop Student Portfolios" (2011). *Staff Publications*. 1.

<https://docs.rwu.edu/atsstaffpub/1>

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# *Using an Open Software System (Sakai) to Develop Student Portfolios*

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## **ABSTRACT**

E-portfolios are digital collections of artifacts that represent the achievements and reflections of individuals. They offer a unique view into student learning and allow educators and external accreditors to assess student progress towards established standards as well as reviewing their program's performance in supporting that progress. Students benefit from assembling their e-portfolios through the process of reviewing their own work with a critical eye, choosing pieces of their work that best represent their abilities, and reflecting on the transformative nature of their University experience, both in class and through extra-curricular, service learning, internships and international activities. An e-portfolio provides a holistic view of a student's personal growth and abilities that will serve them well in their career search or graduate school application. The challenge for an institution is to provide this learning and assessment resource in an accessible and affordable vehicle that is manageable for both faculty and students. Roger Williams University has crafted a strategy to utilize the Sakai open source course management system with its integrated e-portfolio tool set and a linked website to provide both e-portfolios and program assessment. This strategy will also be employed to propose a virtual accreditation of a professional program that will serve as a model throughout the University and the broader higher education community.

Keywords: open source software, e-portfolios, portfolios, eportfolios, assessment, Sakai, learning, reflection, course management systems, learning management systems

## **INTRODUCTION**

Roger Williams University is a small, residential, private liberal arts University including four professional programs located on the coast of Rhode Island in the United States of America. The population includes 3,700 undergraduates and 1,200 graduate and continuing education students. There are a little over 200 full-time faculty and approximately 300 adjunct (part-time) faculty teaching both onsite and online courses.

For the past five years the University has been exploring outcomes-based learning and assessment to focus on developing the characteristics of an educated person as well as fostering the use of reflection and connection to deepen student learning. The use of e-portfolios offers a way for students to showcase evidence of their learning while also reflecting on the transformative nature of their education. This paper will describe the University's first e-portfolio pilot conducted by the School of Architecture, Art and Historic Preservation to support student learning, program assessment and a proposed virtual accreditation review.

## **PROBLEM STATEMENT**

The School of Architecture, Art and Historic Preservation (SAAHP) must undergo a program review every six years by their accrediting agency, the National Architectural Accrediting Board (NAAB). This process normally involves

assembling a large review room holding tables of student models, mounting boards to post student blueprints and hand drawings, setting up computers to display virtual tours of buildings, as well as assembling thick binders for each course in the program that contain multiple printed examples of student work along with the specific NAAB standard or standards associated with each assignment.

A reviewing team then travels to the University to spend many days going through the evidence room to determine if the program is meeting the 32 standards at two ability levels required by NAAB. The process of preparing for this review is both time-intensive and costly for the SAAHP faculty and staff. In addition, this process, while satisfying the national accrediting body, still does not provide the broader, deeper view of student learning that informs true program improvement that was desired by the Dean and his faculty.

In the Fall of 2009, Dean of Architecture, Art and Historic Preservation Stephen White had a goal of utilizing technology to accomplish a virtual accreditation for the next accrediting visit in Spring 2012. His vision was to provide a way for a reviewing team to sit at a computer and click through a collection of student evidence organized by standard and level of achievement that would also include students' reflections on their own learning. At that time the requirements for NAAB consisted of supplying two pieces of evidence of high level work and one example of low level work from two courses at four levels of achievement (primary ability, primary understanding, general ability and general understanding). By utilizing technology the goal would be to provide a wider range of student work that would not only serve to provide appropriate evidence for the national reviewing team every six years but would also serve as an annual program review methodology for the SAAHP faculty to allow for continuous improvement. The accrediting team would be able to review the student evidence from their home locations and could utilize collaborative technologies to confer with each other.

## **THE PILOT DESCRIPTION**

The first step towards this project was to meet with the Department of Instructional Design and collaborate on performing a needs assessment for the project and then a survey of available technologies. Although the University was using Blackboard version 8 in 2009, there was an analysis of a range of course management systems (CMS) taking place that year in order to determine the best choice for a CMS when the Blackboard license ended in June 2011. This analysis incorporated some of the needs of the SAAHP program in the review, one of which was a requirement for an integrated e-portfolio system. In 2009 the main choices for a mature course management system that included an integrated e-portfolio were narrowed down to Blackboard and the Sakai Collaborative Learning Environment (CLE) which was an open source environment. After a thorough review the University decided on migrating to Sakai as a flexible and cost efficient system that would meet all the needs of our faculty and students.

The Sakai Collaborative Learning Environment (CLE) version 2.6 was installed on a University server in the Fall of 2009 and underwent testing and review by the three members of the Instructional Design team. A SAAHP pilot was introduced for the Spring 2010 semester that included 14 courses, 12 Architecture faculty members and 200 students delivered on the Sakai CLE (note that all other University courses were still being delivered via Blackboard that semester). The preparations for this pilot were to:

- Refine a curriculum map in Excel that linked all 32 national standards to assignments in specific courses and identify the expected level of achievement for each
- Utilize the SAAHP website as a planning and information site for faculty
- Develop a custom course matrix using the Sakai matrix tool that covered the 32 NAAB standards at two levels of achievement (Ability and Understanding)
- Develop a custom program matrix using the Sakai matrix tool that mapped each course to the standards it supported
- Embed a copy of the course matrix in all the courses participating in the pilot

- Create electronic assignments in each of the pilot courses and link each assignment to the course matrix using the curriculum map as a guide. Electronic assignments were graded by faculty and the grades automatically copied to the electronic grade book in each course
- Train students to prepare their assignment submissions in electronic form and submit them to their courses in Sakai (which included mastering optimized scanning and pdf conversions, as well as utilizing digital cameras and digital video recordings to capture their work). Part of this process entailed faculty crafting of a standard file naming convention that would identify each assignment and also provide search parameters for custom reports. The file naming convention included the course identifying code, section, term, assignment and the student's last name and first initial (for example ARCH214\_02\_11FA\_a1\_smithj.pdf).
- Develop a custom e-portfolio template that students could use to build their own e-portfolios drawing on their electronic assignment submissions, individual reflections and a resume
- Provide training and support for the faculty and students in using Sakai

The pilot faculty met with the Instructional Design team once a week throughout the semester for ongoing feedback, course or process modifications, training and problem resolution. The Instructional Design team also provided in-class training for students on building their own e-portfolios.

## CHALLENGES

### *Developing a Standards-Based Curriculum Map*

The Dean, program coordinators and faculty had already done a great deal of work mapping their course assignments to different standards however there was still some confusion about which assignments served as primary coverage of a standard at a certain level of ability. The faculty did work with the Dean to refine their assignments and choose specific courses to address individual standards. This work was captured in an Excel curriculum map, listing the 32 standards across the top and the courses in the first column.

Roger Williams University School of Architecture, Art and Historic Preservation																																		
Architecture Program Matrix: BS + MArch Degree Program																																		
Required Courses: 2011-12 Catalog																																		
Date: 09/15/11																																		
Bachelor of Science in Architecture (pre-professional degree program)																																		
	A. Critical Thinking and Representation											B. Integrated Bldg Practices, Tech Skills + Knowledge											C. Leadership and Practice											
	A1 Communication Skills	A2 Design Thinking Skills	A3 Visual Communication Skills	A4 Technical Documentation Skills	A5 Investigative Skills	A6 Fundamental Design Skills	A7 Use of Precedents	A8 Ordering Systems Skills	A9 Historical Traditions and Global Culture	A10 Cultural Diversity	A11 Applied Research	B1 Pre-Design	B2 Accessibility	B3 Sustainability	B4 Site Design	B5 Life Safety	B6 Comprehensive Design	B7 Financial Considerations	B8 Environmental Systems	B9 Structural Systems	B10 Building Envelope Systems	B11 Building Service Systems	B12 Building Materials and Assemblies	C1 Collaboration	C2 Human Behavior	C3 Client Role in Architecture	C4 Project Management	C5 Practice Management	C6 Leadership	C7 Legal Responsibilities	C8 Ethics and Professional Judgement	C9 Community and Social Responsibility		
Foundation																																		
ARCH 101 Found									U																									
AAH 121									U																									
AAH 122																																		
VARTS 101																																		
Design																																		
ARCH 113																																		
ARCH 114																																		
ARCH 213								A								A																		
ARCH 214								A																										
ARCH 313		A	A													A																		
ARCH 413 (opt)																																		

Figure 1 A portion of the SAAHP Curriculum Map

## *Sakai Fluency*

Some of the pilot faculty had utilized Blackboard in the past and some had never used a course management system. The team established weekly meetings with the Instructional Design team to work on mastering the Sakai system (rebranded as Bridges) and customizing their courses. Two of the pilot faculty (Gregory Laramie and David Corbin) became proficient at the system and served as mentors to their colleagues within their own building, which was tremendously helpful in moving the project forward.

## *Electronic Conversion of Work*

Most of the pilot consisted of sophomore courses. Some of these courses required hand-drawn work to demonstrate foundational skills. Initial scanning of this student work was unsatisfactory to the faculty in demonstrating the quality of the drawings. The Dean purchased a large bed, high quality scanner to solve this problem and the Architecture and Instructional Design staff worked with the students to achieve an optimal reproduction of their work to upload into their courses. For these courses the hand-drawn work was graded manually and then the students scanned and uploaded their work into the courses and faculty manually added the grades to the course grade book.

## *Standardizing Filenames and Formats for Student Work*

Early attempts at file submission by students revealed an inconsistency in file names and formats as well as difficulty with file sizes. Sakai assignments have a limit of 50 mg. per file as well as a limit of five attachments per assignment when uploading and these restrictions were problematic for many students. The Architecture faculty, including the Dean and all the program coordinators, collaborated on a single file naming convention to resolve the inconsistencies in submissions. This information was transferred to a reference document that was then embedded in the course menu of each course. Faculty agreed to return any student work that did not follow this naming convention and the students quickly adapted. The faculty also decided to standardize on the Adobe Acrobat file format as the most web accessible for all student submissions. Students were instructed on the process of creating multiple page .pdf documents and also on the process of optimizing images to control file size to resolve the uploading issues. Students quickly became proficient at these skills which will also serve them well as practicing architects.

**A reminder relating to the file production standards for digital submissions in the School of Architecture, Art, and Historic Preservation.**

**File Size:** Your file size should be no more than 150 dpi for printing and Bridges (300 dpi for portfolios).

**File Format:** When scanning in pictures, please use JPEG format at the above resolution for all images. Please **do not** use TIFF when scanning. After you have scanned your drawings in, please combine them into a PDF file, also at the above resolution.

**Naming Convention:** File names will be **all lower-case with no spaces (underscore instead)** named starting with the [course id], [section number], [semester], [assignment number], [student's last name + first letter of first name].

Example for John Smith submitting a PDF for assignment 1 for Arch 214 section 02, Spring 2011:

course ID number  
course section (may not apply)  
year & semester (sp=spring, s1=summer 1, s2=summer 2, fa=fall, wi=winter)  
assignment number (assignment = a, project = p)  
student's last name first initial (for example, Jane Smith = smithj)  
underscore

arch214\_02\_11sp\_a1\_smithj.pdf

Figure 2 Student Instructions for File Naming Convention and Formats

### *Development of Sakai Matrices*

Since Sakai was still new for this pilot, no one on staff had the skills to develop the original matrices so this work was outsourced to a vendor. The original course matrix reflected the 32 standards in the first column with four levels of achievement across the next four columns (see example below).




<b>ARCH 214 06 10SP Matrix</b>	<b>Primary Ability</b>	<b>Primary Understanding</b>	<b>Ability</b>	<b>Understanding</b>
<b>A. Critical Thinking and Representation</b>				
<b>A1 Communication Skills</b>				
<b>A2 Design Thinking Skills</b>				
<b>A3 Visual Communication Skills</b>				
<b>A4 Technical Documentation Skills</b>				
<b>A5 Investigative Skills</b>				
<b>A6 Fundamental Design Skills</b>				

Figure 3 An example of the original course matrix

The original program map intended to reflect all 32 standards for all courses involved in the accreditation process at four levels of ability. The intent was to aggregate all student submissions from all courses in the matrix by standard and ability level that would serve as a single point of contact for the reviewing team.

Click on a cell to view/edit









SAAHP Program Matrix	PreProf ARCH BS	ARCH 214 PrimAbil	ARCH 214 Abil	ARCH 214 PrimUnd	ARCH 214 Und	ARCH 287 PrimAbil	ARCH 287 Abil	ARCH 287 PrimUnd	ARCH 287 Und	ENGR 300 PrimAbil	ENGR 300 Abil	ENGR 300 PrimUnd	ENGR 300 Und	HP 382 PrimAbil	HP 382 Abil	HP 382 PrimUnd	HP 382 Und	VARTS 101 PrimAbil	VARTS 101 Abil	VARTS 101 PrimUnd	VARTS 101 Und	N Ac A
A. Critical Thinking and Representation																						
A1 Communication Skills																						
A2 Design Thinking Skills																						
A3 Visual Communication Skills																						
A4 Technical Documentation Skills																						

Figure 4 Early example of SAAHP Program Map with aggregated work

The initial plan for linking a single assignment to both a course matrix and the program matrix was compromised by the inability of Sakai version 2.6 to accomplish linking to multiple matrices. Fortunately the Sakai community had been working on this issue and had added this functionality to version 2.7 that came out later that Spring in time for implementation towards the end of the project.

One of the benefits that emerged as a result of the embedded matrices was the opportunity for students to be continually reminded of the standards that are valued by their chosen field and the connection between the assignments they are working on in different courses with the national standards they are fulfilling. This brought a unique consciousness of these standards and their underlying connection to their coursework. Yancey (2004) notes: “What we ask students to do is who we ask them to be.”

Another benefit of linking assignments to matrix cells was the automatic attachment of metadata to the assignment identifying the standard and level of achievement. This is critical for the use of custom reporting.

### *Curriculum Assessment and Review System*

Towards the end of the pilot when work had been collected in both the course matrices and the program matrix it was discovered that the load time for the program matrix was unacceptable due to both the size of the matrix as well as the amount of student information included within its cells. In several brainstorming sessions between the Architecture and Instructional Design staffs a new approach emerged that involved having faculty identify the requisite two pieces of high level work and one piece of low level work from each assignment designated as supporting progress towards one or more of the national standards into a designated course folder. The folder and associated student evidence is then linked to an external website. This website, now referred to as the Curriculum Assessment and Review System (C.A.R.S.) would be able to organize and disseminate selected student work by standard drawn from the Sakai courses. Russell Beauchemin, a member of the Instructional Design staff, designed and developed this Flash-based site and included pages on the site for:

- An Introduction to the School and its mission and goals
- Links to the Assessment Standards for each accrediting body within the School of Architecture, Art and Historic Preservation
- A listing of the accompanying Excel-based curriculum matrices for each program in the School

- Evidence by standard, which breaks out each Architecture standard onto a separate page and encompasses the links back to the student evidence in Sakai,
- Evidence by course which provides links back to each of the evidence folders by course
- Evidence by student which links to student e-portfolios



Figure 5 The Curriculum Assessment and Review System Website

This web-based interface was able to provide easy access to a wealth of student evidence supporting all NAAB standards and will allow the reviewing team to view just the initial two high-one low work for two courses by standard or go deeper into the data for a more comprehensive look. This review can be done on campus at specially outfitted computer stations with 30-inch monitors or eventually could be done by each team member from their home campus without the necessity of traveling.

#### *Student E-Portfolios*

Another goal of this project was to incorporate an assessment model that would allow for a more holistic view of student learning. By utilizing e-portfolios, the students would not only be able to demonstrate their mastery of particular skills using multimedia, there would also be an opportunity to build in their reflections on what has been transformative for them as they progress towards their chosen field as well as how some of the work they are doing is connected across the curriculum. All of their work is aggregated and accessible within Sakai so there is also an opportunity to go beyond a course e-portfolio to create multiple e-portfolios, including a showcase or career e-portfolio that will serve them well when they are ready to graduate or applying for an internship. The customized e-portfolio template was also outsourced to a vendor and training was provided for the students to implement their e-portfolios.





Figure 6. An Example of an Architecture Student E-Portfolio

## RESULTS

A review of the pilot was conducted by the Architecture faculty at the end of the Spring semester and the recommendation was to go to full implementation for the entire Architecture program for Fall 2010. The project's three major components of Planning (labeled PLANES), Assessment (C.A.R.S) and E-Portfolios (PORTS) provided what is now referred to as the SAAHP CYCLES outline and provides sufficient support for a virtual accreditation.

*Student Performance Improvement:* Faculty involved in the pilot noted an increase in student performance based on student awareness of learning outcomes and professional expectations; observation of work-in-progress and an increased ability to reflect on goals and achievements. Faculty member Gregory Laramie noted that his students for Fall 2010 were able to quickly grasp many of the concepts for the course because they were able to view student work from the prior semester. This allowed the class to progress further than others in the subject area.

Students who participated in the pilot program became mentors for the students taking the courses the following year, helping them with converting their work to digital format and optimizing their graphics and file size. The mentoring kept their own skills sharp while scaling out support for the new students.

*Instructor Performance Improvement:* Faculty involved in the pilot found that being able to view student evidence across multiple sections allowed them to share a deeper view of student learning. Utilizing the course matrices and connecting their assignments to specific standards helped focus attention on course development and fostered a sense of collaboration among the faculty. Pilot faculty also provided mentoring for their colleagues the following year.

*Program Performance Improvement:* The ongoing discussion of the NAAB standards and how they connect to courses and assignments in the program provided all SAAHP faculty with a heightened awareness of their own program objectives, a greater sense of how their course fit into the overall program and a heightened awareness of student progress toward the learning outcomes. This review process identifies areas of satisfactory support of program objectives and also highlights areas that need attention. This exercise is not only valuable for the six-year

accrediting cycle for NAAB but also vital for ongoing, annual program improvement. Dean White notes that “Technology-enabled assessment improves our self-awareness as well as our awareness of each other.”

## NEXT STEPS

Following the pilot, additional refinements were made when the entire Architecture program adopted this system of assessment. During the summer of 2010 the University moved to a hosted version of Sakai and upgraded to version 2.7 to leverage the improvements in the system.. The NAAB standards for the 2011-2012 had changed slightly from those used in the pilot and the levels of achievement were reduced to two: Ability and Understanding. These changes required modifications to the course and program matrices. Gregory Laramie, who had taken the lead on this project, also redesigned the individual course matrices to include assignments.




















TEST NAAB Course Matrix TEST	A1 Communication Skills	A2 Design Thinking Skills	A3 Visual Communication Skills	A4 Technical Documentation Skills	A5 Investigative Skills	A6 Fundamental Design Skills	A7 Use of Precedents	A8 Ordering Systems Skills	A9 Historical Traditions & Global Culture	A10 Cultural Diversity	A11 Applied Research	B1 Pre- Design	B2 Accessibility	B3 Sustainability	B4 Site Design
Assign 1 Ability															
Assign 1 Understanding															
Assign 2 Ability															
Assign 2 Understanding															
Assign 3 Ability															
Assign 3 Understanding															
Assign 4 Ability															

Figure 5. Example of the revised course matrix with student work

All Architecture courses are provided with the same course template in Sakai that includes all the portfolio tools and electronic assignments as well as guiding documentation. Ongoing training is offered for faculty and students on the use of Sakai and e-portfolios.

The planning website (PLANES) was converted to a Sakai project site to allow easier access for all program faculty and students to committee work progress and organizational information.

The custom e-portfolio template provided by the vendor was sufficient for the initial project however student feedback indicates that a more flexible option would be preferable. Although there is a Sakai make-your-own option, the functionality was unsatisfactory so the plan is to develop additional templates that will allow for more creativity.

Exemplary student e-portfolios will also be featured on the SAAHP website to illustrate the type of work going on in the program for prospective students and their parents as well as other members of the University community and beyond.

Although the NAAB team will still be visiting the University onsite in Spring 2012 and will still require an evidence room, there will also be computer stations set up for them to do a virtual review. The hope is that this model will be compelling enough to change the process for the next review and allow for virtual accreditations in the future.

## *University Impact*

Following the example of the School of Architecture, Art and Historic Preservation, other programs at the University have now adopted their own e-portfolio assessments. The Master of Public Administration and Master of Leadership programs are now among only three graduate programs in the United States to require e-portfolios for graduation. These e-portfolios include multimedia content including video reflections from the students.

The School of Education requires e-portfolios for all their graduates and also encourages students to take advantage of the multimedia opportunities of this electronic medium to include evidence such as video clips of their student teaching experiences.

There are currently e-portfolio pilots being conducted for the Aquarium minor in the Marine and Natural Sciences program as well as First Year Seminar General Education courses.

Jim Beitler, one of the Writing Studies faculty, has piloted the use of e-portfolios with his writing courses for two semesters and has seen an overall improvement in student work as well as increased awareness of their own learning. Professor Beitler sees four possible purposes of the e-portfolio for students: My Learning Profile, Integration of My Learning, The Range of My Learning and Application of My Learning. He prompts students throughout the course with reflection questions that raise awareness in all four areas. One of his students noted: "I've learned a lot about how I learn" as the result of creating an e-portfolio and mapping assignments in a course outcomes matrix.

## **CONCLUSION**

The successful SAAHP pilot and subsequent implementation of electronically collecting student assignment submissions, organizing and tagging that work by standard, analyzing and comparing student submissions across courses for progress toward program goals has allowed a unique look into student learning and program evaluation. Although this project started as a vision of a virtual accreditation review, the results have produced a richer student learning environment and a sound process for ongoing program improvement for the faculty.

Through the creation of e-portfolios, students have discovered new connections between the work they are doing and the outcomes for both courses and programs. In addition, the process of selecting work to feature in their e-portfolio and their reflection has allowed them to identify themes that connect all of their courses in advancing their learning.

Utilizing the Sakai open source course management system with the integrated e-portfolio tools allows this approach to serve as a flexible and affordable model for other institutions that wish to improve program review, foster deeper learning and conduct their own virtual accreditations.

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