
Closing the Loop on a Continuous Program Improvement Process

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Abstract

The WebBSIT, a Bachelor of Science in Information Technology, is a fully online degree offered through a consortium of five University System of Georgia institutions. This paper begins by summarizing the change management system developed for continuous program improvement. Analysis of data should drive improvement, closing the loop. The balance of this paper presents an outline for stakeholder participation, describing critical checkpoints in the process that must occur to close the loop on closing the loop.

Background of the Georgia WebBSIT

The Georgia Bachelor of Science in Information Technology (BSIT) degree program (WebBSIT, 2010) is offered collaboratively by five University System of Georgia (USG) institutions: Armstrong Atlantic State University; Clayton State University; Columbus State University; Georgia Southern University; and Southern Polytechnic State University.

The degree requires that students be admitted to one of the five collaborating institutions. The WebBSIT offers the lower division Information Technology core curriculum (18 hours) and all upper division courses (51 hours) entirely online. The program assumes that students have completed most of their general education courses before beginning.

Curriculum and Course Development

The WebBSITs focus was the development of an integrated curriculum rather than a set of discrete courses. The BSIT curriculum is built on nine core program outcomes. Each individual course addresses a subset of these program outcomes. Outcomes are mapped to courses using Blooms taxonomy of the cognitive domain (Bloom, 1956). Students are expected to demonstrate competency in each outcome at some level of mastery: developing, mature, or proficient.

Program outcomes are broad statements about the skills students should acquire as they move through the curriculum. Each course has more specific objectives designed to address the topics of the course. Course Architects create one or more course outcomes to support each program outcome that has been mapped to a course. Writing concise course outcomes is difficult. To make the job easier, over the years sets of action verbs (Rothwell Kazanas, 2008) have been associated with each level in Blooms Taxonomy. The WebBSIT used these action verb sets to develop a tool to assist Course Architects in the

writing of course outcomes. See Appendix A.

Initially, WebBSIT courses were developed and offered using WebCT Vista version 3. In the summer of 2009, courses were migrated to WebCT/Blackboard Vista version 8. Vista 8 provides a *Goals* tool that allows program outcomes (goals) to be recorded. The *Goals* tool can record program outcomes and associated course objectives (course outcomes). A sample from one course has been provided. See Appendix B. Within this structure, content files, assessments and assignments can be associated with one or more goals. As part of the migration to Vista 8, Course Architects embedded the program outcome-course outcome-assessment hierarchy into each course. As a result, assessment data can now be collected and used to evaluate the curriculum. A sample from one course has been provided. See Appendix C.

Change Management System

The WebBSIT is using roles and business rules to enforce a change management system for the collaborative (Booth, Booth, Hartfield, 2009). The WebBSIT Operating Board is responsible for oversight of the curriculum, modification of program outcomes, and approval of course learning objectives that support program outcomes.

The Executive Directors role is that of project manager for course development. The Instructional Designer helps to ensure that courses map properly to online pedagogy. The Course Section Instructor role is that of content expert with online teaching expertise.

The Course Architect collaborates with the Operating Board and Executive Director to implement continuous course improvement. The Course Architect incorporates feedback from a variety of sources to initiate change. Minor updates and improvements to courses (new or updated content modules, assignments, or assessments) are the purview of the Course Architect. Changes that impact course outcomes or program outcomes must be referred to the Operating Board.

Critical Checkpoints

In any system where improvement depends on critical analysis of data, checkpoints should be designed into the process. A checkpoint serves a quality control function where the activities of various roles intersect. New perspectives are brought to bear and differences worked out.

A checkpoint is a decision nexus. Data about past performance is analyzed and decisions about change for the future are made. In a change management system, checkpoints document change. In most education environments, organizational boundaries where oversight normally occurs provide natural checkpoints. For example, individual teaching faculty evaluate student performance in courses and initiate instructional change. At the departmental level, individual courses are evaluated in light of the curriculum as a whole. At the college or school level, departmental performance is evaluated from the perspective of the college or schools contribution to the community and university.

From the standpoint of a change management system designed to improve curriculum and instruction, work must occur at several critical checkpoints.

Work at the College Level

Develop college outcomes in line with university outcomes.

Establish goals, objectives, and guidelines; an overall plan for achieving college outcomes.

Develop a feedback loop that takes into account departmental performance, faculty feedback, and departmental evaluation of program effectiveness. Revise college outcomes, goals, objectives, and guidelines as necessary. Changes should be documented so that the college can verify continuous improvement.

In the WebBSIT work at the college level is coordinated by the Governing Board. The Governing board members represent the Information Technology

Deans of the several participating institutions. At this level, data from the WebBSIT program is evaluated based on the individual standards of each participating institution. Measures include: number of graduates, number of majors, number of enrollments, placement of graduates, retention and attrition rates, faculty-to-student ratios, and faculty work load.

Work at the Department Level

Develop program outcomes in line with college outcomes.

Map program outcomes to courses. Establish acceptable performance criteria.

For each course, develop core course objectives that support each program outcome mapped to the course. This is a departmental level, top down design, exercise because courses and their prerequisites flow together to create the curriculum as a whole. Courses do not exist in isolation.

Develop a feedback loop that takes into account course performance data, student feedback, and faculty evaluations of courses. Revise program outcomes, course outcomes, and acceptable performance criteria as necessary. Changes should be documented so that the department can verify continuous program improvement.

In the WebBSIT, work at the department level is coordinated by the Operating Board. A spreadsheet tool was developed to collate data collected across all courses and sections to provide an overall picture of student success in meeting program outcomes. Measures include: For each program outcome a comparison of student performance with established performance criteria, student evaluations of courses, section instructor evaluation of courses, Course Architect recommendations.

Work at the Faculty Level

Develop additional course objectives. This secondary set of course objectives encourages bottom-up evolution of the curriculum. For both core course objectives and secondary course objectives, develop instructional components designed to teach course objectives.

Develop assessments and corresponding rubrics for each course objective.

Create a spreadsheet for recording student performance based on assessments and rubrics. Note: be as discrete as possible. For example, if a test covers two or more objectives, the spreadsheet elements for recording the test should have a column for each objective. This is the most difficult part of the task because it will likely require each faculty member to critically evaluate their assessment procedures. Also, some assessments may not lend themselves well to discrete analysis.

A separate section of the grading spreadsheet should contain roll-up formulas that summarize overall student performance that can be compared to established performance criteria. While each faculty member may have individual and creative instructional components, assessments, and rubrics, the roll-up should be standardized so that departmental summaries of course objectives and program outcomes are easy to achieve.

Develop a feedback loop that takes into account student performance, student feedback, and peer evaluations of teaching effectiveness. Revise instructional components, assessments, and rubrics as necessary. Changes should be documented so that faculty can verify continuous course improvement. Proposed changes to program outcomes and/or core course objectives should be submitted to the Department for consideration by the faculty.

In the WebBSIT, work at the faculty level is coordinated by the Course Architect. The Course Architect relies on feedback from students, and section instructors. Constant Contact was used to create a survey tool to document student feedback on courses and instruction (See Appendix D). Section instructors embed notes to the Course Architect in the course itself. A spreadsheet tool was developed to help Course Architects extract and assemble assessment data for each course objective (See Appendix C).

Conclusions

It's all well and good to have in place a continuous improvement plan. Ideally, such a plan would include checkpoints where changes supported by data are routinely recorded. Faculty are generally evaluated on teaching effectiveness yearly. Typical measures include: student grade analysis, student feedback via end-of-semester evaluations of courses and instruction, peer evaluations of teaching, and so on. A more effective measure would be an examination of what teaching faculty do with this data to improve instruction and courses. If faculty recorded the changes made to each course along with the supporting data, a yearly record of continuous improvement would accrue.

Significant changes to curriculum are generally approved by departmental, college, or school curriculum committees. Usually, a rationale for change is included in any proposal. Such rationale may be driven by outside influences such as accrediting bodies, professional standards, or community requirements. But when applicable, changes driven by analysis of data collected should be included. Again, a yearly record of continuous improvement would accrue. University-wide curriculum committees could have a positive impact on the collection of relevant data by simply requiring analysis of collected data in support of any proposal.

Closing the loop on closing the loop requires concerted effort to collect and analyze relevant data at pre-defined checkpoints. Just saying that continuous improvement is observed is not enough. Checkpoints create the habit of collecting and then using data to make informed decisions about the evolution of courses and curriculum. Checkpoints provide the documentation necessary to verify the effectiveness of continuous program improvement.

References

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Appendix

Appendix A: Writing Course Objectives

Developing Level of Mastery: Demonstrates an emerging level of knowledge and skills; can perform beginning skills and shows potential to perform independently.

Mature Level of Mastery: Demonstrates a refined level of comprehension; is able to apply appropriate skills and perform both independently and as a team member.

Proficient Level of Mastery: Demonstrates a superior level of knowledge and understanding; integrates and applies skills across multiple areas both independently and as a team member.

Sample Action Verbs to Use When Writing Measurable Course Objectives
Adapted from Rothwell and Kazanas (2008, page 181)

Developing		Mature		Proficient	
Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
<i>define</i>	<i>translate</i>	<i>interpret</i>	<i>distinguish</i>	<i>compose</i>	<i>judge</i>
<i>repeat</i>	<i>restate</i>	<i>apply</i>	<i>analyze</i>	<i>plan</i>	<i>appraise</i>
<i>record</i>	<i>discuss</i>	<i>employ</i>	<i>differentiate</i>	<i>propose</i>	<i>evaluate</i>
<i>list</i>	<i>describe</i>	<i>use</i>	<i>appraise</i>	<i>design</i>	<i>rate</i>
<i>label</i>	<i>recognize</i>	<i>demonstrate</i>	<i>calculate</i>	<i>formulate</i>	<i>predict</i>
<i>match</i>	<i>explain</i>	<i>dramatize</i>	<i>experiment</i>	<i>arrange</i>	<i>value</i>
<i>memorize</i>	<i>indicate</i>	<i>practice</i>	<i>test</i>	<i>collect</i>	<i>revise</i>
<i>name</i>	<i>identify</i>	<i>illustrate</i>	<i>compare</i>	<i>construct</i>	<i>score</i>
<i>order</i>	<i>review</i>	<i>operate</i>	<i>contrast</i>	<i>create</i>	<i>select</i>
<i>recall</i>	<i>sort</i>	<i>schedule</i>	<i>criticize</i>	<i>set up</i>	<i>choose</i>
<i>reproduce</i>	<i>classify</i>	<i>solve</i>	<i>diagram</i>	<i>organize</i>	<i>assess</i>
		<i>sketch</i>	<i>inspect</i>	<i>manage</i>	<i>estimate</i>
		<i>choose</i>	<i>categorize</i>	<i>prepare</i>	<i>argue</i>
		<i>schedule</i>	<i>inventory</i>	<i>assemble</i>	<i>assess</i>
			<i>question</i>		

Examples:

Developing

- Students will *recognize* and *describe* database design methodologies.
- Students will *identify* and *explain* database concepts.

Mature

- Students will *use* and *apply* web skills to plan a website.
- Students will *demonstrate* mature writing skills to produce written reports.
- Students will *compare and contrast* the concepts of query optimization.

Proficient

- Students will *appraise and evaluate* the issues and problems of multi-user databases.
- Students will *assess* the fundamental concepts of concurrency control.
- Students will *formulate* basic techniques for database security

Appendix B: Program Outcome-Course Outcome-Assessment Hierarchy

WebBSIT Program Outcome #5

Identify and investigate current and emerging technologies and assess their applicability to address individual and organizational needs.



Course Outcome 3: Describe the major components of information technology applications: Hardware, computer networks, software, data, processes, and people.

Maps to Program Outcome 5

Course Outcome 3 is associated with the following learning objects:

1. [Unit 2 Assignment-Graphics](#)
2. [Unit 1 Quiz](#)
3. [Unit 3 Quiz](#)
4. [Unit 3 Assignment 1-Working with Binary Numbers](#)
5. [Unit 3 Assignment 2-Pencil and Paper Computer](#)



Course Outcome 4: Identify and describe the different components of a computer network.

Maps to Program Outcome 5

Course Outcome 4 is associated with the following learning objects:

1. [Unit 4 Quiz-12E](#)
2. [Unit 4 Assignment - Network Infrastructure](#)



Course Outcome 5: Describe and explain the different types of networks.

Maps to Program Outcome 5

Course Outcome 5 is associated with the following learning objects:

1. [Unit 4 Network Discussion](#)



Course Outcome 6: Define and discuss "Software Engineering".

Maps to Program Outcome 5

Course Outcome 6 is associated with the following learning objects:

1. [Unit 5 Systems Discussion](#)



Course Outcome 9: Discuss the role of databases in IT applications.

Maps to Program Outcome 5

Course Outcome 9 is associated with the following learning objects:

1. [Unit 7 DB Discussion](#)

Appendix C: Program Outcome-Course Outcome-Assessment Data

Program Outcome	78%																																																					
Program Outcome 2	83%																																																					
Program Outcome 3	N/A																																																					
Program Outcome 4	N/A																																																					
Program Outcome 5	83%																																																					
Program Outcome 6	83%																																																					
Program Outcome 7	89%																																																					
Program Outcome 8	83%																																																					
Program Outcome 9	87%																																																					
Course Outcomes	3	2	3	7	3	3	3	1	2	11	4	8	8	10	4	8	8	10	5	6	11	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12					
Assessments	Unit 1 Quiz	Unit 2 Quiz	Unit 3 Quiz 12E	Unit 1 Assignment-Create a Web Page 1	Unit 2 Assignment-Graphics 1	Unit 3 Assignment 1-Working with Binary Numbers	Unit 3 Assignment 2-Pencil and Paper Computer 1	Unit 1 Careers Discussion	Unit 2 Discussion-Issues	Unit 3 Discussion-History	Midterm Test	Unit 4 Quiz-12E	Unit 5 Quiz-12E	Unit 6 Quiz-12E	Unit 7 Quiz-12E	Unit 4 Assignment - Network Infrastructure 1	Unit 5 Assignment-Drawing a DFD 1	Unit 6 Assignment- CeeBots 1	Unit 7 Assignment Working with Databases 1	Unit 4 Discussion - Networks	Unit 5 Discussion - Systems	Unit 6 Discussion - Programming	Unit 7 Discussion - DBI	Term Project Milestone 1	Term Project Milestone 2	Project Discussion - Project Team 4	Project Discussion - Project Team 3	Project Discussion - Project Team 2	Project Discussion - Project Team 1	Final Test																								
Possible Points	100	104	100	100	100	100	100	100	100	100	105	105	100	100	102	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100				
Student 1	56	96.75	79.5	100	90	85	89	85	69	74.5	71	72	52	96	80	75	100	0	75	0	0	0	83	93																								Student 1	Withdraw					
Student 2	82	92.75	82	100	90	100	93	85	69	74.5	71	72	52	96	80	75	100	0	75	0	0	0	83	93																										Student 2				
Student 3	91	94	91	100	100	100	100	100	64	88.5	97	94	94	93	100	97	100	100	100	82	89	78	83	93																											Student 3			
Student 4	87.5	79.3	81.5	100	90	100	80	85	76	59	83	86	84	90	65	91	100	100	82	80	78	80	83	93																											Student 4			
Student 5	85	77.1	70.5	100	100	100	89	80	73	89.5	87	96	80	87	100	91	100	85	66	64	59	80	90	88																											Student 5			
Student 6	88.5	87.35	80	100	100	95	78	80	73	85.5	97	84	74	93	100	77	97	90	82	89	78	82	90	88																											Student 6			
Student 7	80.5	75.75	77	95	90	95	80	0	39	97	88	94	93	85	75	100	75	82	71	0	82	90	88																												Student 7			
Student 8	62	93	81	100	90	100	100	96	96	85.5	97	94	92	99	100	90	100	100	96	92	92	92	90	88																											Student 8			
Student 9	74.75	64.8	63.5	100	90	100	76	92	76	84.5	77	78	64	51	100	97	97	70	78	0	0	0	83	93																											Student 9			
Student 10	79.25	92	74.5	100	75	100	92	98	90	54.5	70	80	74	57	100	75	100	70	96	90	80	80	82	92																											Student 10			
Student 11	75	94	81	100	90	100	100	93	79	33	83	86	60	0	100	75	100	0	87	96			86	96																											Student 11			
Student 12	68.5	75.2	61.5	90	75	100	71	89	69	58	73	60	34	57	80	70	0	0	75	0	78	82	86	96																										Student 12				
Student 13	72.5	74.35	63	100	90	100	86	83	50	70																																									Student 13	Withdraw		
Student 14	83	78.35	87	100	90	95	82	94	50	62	69	62	74			70			66				86	96																										Student 14				
Student 15	76		100				100																																												Student 15	Withdraw		
Student 16	91.75		100				86																																												Student 16	Withdraw		
Student 17	88.5	89.3	86	100	100	100	90	72	100	92	93.5	87	90	92	93	100	81	100	100	89	93	78	78	86	96																											Student 17		
Student 18	79.5	86.75	74.5	100	90	100	90	71	87	85	88.5	99	94	86	93	65	81	100	70	89	78	73	73	82	92																											Student 18		
Student 19	80	85.7	87.5	100	90	100	96	80	92	76	91	92	86	81	80	75	97	75	85	66	73	78	82	92																												Student 19		
Student 20	80	91	80	100	90	100	100	100	100	92	82.5	95	88	74	93	80	87	100	100	85	92	89	85	82	92																												Student 20	
AVERAGES	79.06	84.86	77.83	99.25	90.56	98.33	92.19	87.05	84.83	72.12	70.94	83.81	83.88	75.88	78.40	89.00	81.69	92.73	69.00	83.31	66.20	61.93	69.29	85.25	92.25	93.75	75.00	77.50	87.50	74.93																								
Achievement %	79%	82%	78%	99%	91%	98%	92%	87%	85%	72%	68%	82%	84%	76%	77%	89%	82%	93%	69%	83%	66%	62%	69%	85%	92%	94%	75%	78%	88%	75%																								

Appendix D: Sample Survey-Student Opinion of Course and Instruction

Constant Contact Survey Results

Survey Name: Evaluation Fall09 WBIT 1100

The pace of the assignments and discussions was reasonable for this course.

Top number is the count of respondents selecting the option.

Bottom % is percent of the total respondents selecting the option.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
0	0	1	4	5	0
0%	0%	10%	40%	50%	0%

The course goals and objectives were easy to understand.

Top number is the count of respondents selecting the option.

Bottom % is percent of the total respondents selecting the option.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
0	0	0	5	5	0
0%	0%	0%	50%	50%	0%

The activities and assignments were closely aligned with course goals and objectives.

Top number is the count of respondents selecting the option.

Bottom % is percent of the total respondents selecting the option.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
0	0	0	3	7	0
0%	0%	0%	30%	70%	0%

The course learning projects or activities added to my understanding of course materials.

Top number is the count of respondents selecting the option.

Bottom % is percent of the total respondents selecting the option.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
0	0	1	5	4	0
0%	0%	10%	50%	40%	0%

Dates for assessments and proctored exams were clearly posted.

Top number is the count of respondents selecting the option.

Bottom % is percent of the total respondents selecting the option.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
0	0	0	3	7	0
0%	0%	0%	30%	70%	0%

The amount of work necessary to succeed in this course was clearly communicated.

Top number is the count of respondents selecting the option.

Bottom % is percent of the total respondents selecting the option.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
0	0	0	4	6	0
0%	0%	0%	40%	60%	0%

Online Journal of Distance Learning Administration, Volume XIII, Number II, Summer 2010
University of West Georgia, Distance Education Center
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