Front-End Analysis Plan for Rapid Prototyping of Web-Based Instructional Support Systems for Introductory College Science Environments

Aaron Fried

IDE712

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Introduction and Problem Description

Large courses present a variety of challenges for instructors and students (Weimer 1994). The State University of New York (SUNY) at Cortland requires all students to complete a general education sequence by taking a series of liberal arts and science credits. Many students choose to enroll in the introductory Biology courses; courses that have seen enrollment rise up to 750 students a semester.

It is possible for the Department of Biology to provide quality science instruction, however, the traditional large classroom is not without problems. Students sit in large lectures where learning is less active and less personalized. These large classes prove hard to assess on a regular basis and assessment usually takes the form of multiple-choice tests. Large populations of students come from a variety of different backgrounds and differing skill abilities. Students from different departments come into the classes with a variety of career and educational goals.

The introductory Biology courses at SUNY Cortland are divided into three to four lecture sections with about 21 – 27 laboratory sections. Three lecturers and four lab instructors teach all of these different classes. In addition, there are several graduate assistants, recitation instructors, departmental and Student Services tutors involved with the courses. Communication between any of the human components of this educational system is difficult to coordinate.

These issues lead to frustration from both instructors and students. These are not simple problems, however, they are important considerations for the Biology Department and the college administration to consider.

Potential Solutions

There are several solutions that the Department of Biology and SUNY Cortland could use to solve some of these problems. There are potential organizational solutions that could impact communication issues. For example, many of the support systems (tutoring and recitation) exist as a separate entity from the department. Bringing those non-departmental positions under the organizational structure of the course might help to solve this problem. This may be an especially important feature when considering that some students might have their most individualized experience with tutors or recitation instructors.

An attempt to reduce the size of the lectures has already been implemented by creating small lab sections that serve a small population (24 students) of the larger course population. Another solution to the problem of the class size would be the inclusion of more instructors for the course. This option comes at a high financial burden for the department and institution. In addition, this solution might increase the problem already encountered with communications.

The department could employ more graduate students to serve as assistants for the course. This could help to ease the burden of assessment in a large course and help students increase their active participation and individualized experience in the course. This solution also comes with the financial burden of support for the graduate students. The graduate students might also require training in order to have the necessary content knowledge skills and instructional ability to work with the students.

One particularly viable option for this problem could be the implementation of a web-based instructional support system (WBISS). The WBISS would serve as a support

system that would supplement the course. This solution has the potential to provide each student in the course an active and personalized component. Students would work within the WBISS environment to actively complete tutorials and simulations. Students could have access to course materials that would aid their studying. Students with skill or content deficiencies could work to build up their prerequisite knowledge. The WBISS could be hyperlink rich in order to provide students access to information from the course and how it might relate to their potential career or field of study. Students could complete online pre-assessment and course assessment in order to provide the students with the opportunity to have immediate feedback on their work and to see their weaknesses in the course before it becomes too late. The WBISS also allows for immediate and automatic evaluation of the instructional plan

The WBISS could also help to coordinate communication between instructors and students. Chat rooms and message boards provide instructors and students the ability to communicate out of the classroom. These technologies also allow for important communication skills, like debate, to occur in the course. Normally, debate or classroom discussion would be difficult to complete in a class of 200 or more students.

The WBISS will require the resources of current faculty members in the department and support staff at the institution. There may be a need for extra support for these individuals, but this option may not require the addition of new faculty members. Additionally, the institution already has a certain amount of technology available to the department. Initial technology investments may be kept to a minimum if the department can make good use of existing resources.

The above solutions only represent several options as far as potential solutions are concerned. Perhaps the WBISS is the most viable solution because it takes advantage of many available resources and it address the most problems presented by the large classes. The WBISS allows the department to reach out to the students in the dorms, in student computing areas, and at home over breaks from school. The WBISS does not cause an additional burden on the students in that they might have to clear specific time from their schedule in order to come to recitations or additional classes during the week in order to receive extra instruction. Because the WBISS is the most viable and most educationally based solution, this front-end analysis plan will focus on determining the gaps and issues related to the creation of the WBISS.

Description of the Training Component of the Solution

A web-based instructional support system (WBISS) is a solution for the problems of a large course. This is a co-educational solution. That is to say that this solution will be implemented to coincide with the current course. The overall goals of this project will revolve around providing a WBISS that gives students:

1. Access to vital course information.
2. Access to resources such as tutorials and simulations in order to make learning in the course more active and personalized.
3. Access to a hyperlink rich environment that will allow students to pursue their own interests.
4. Access to powerful communication tools (e.g. email, chat rooms, message boards) in order to increase their ability to coordinate their communication and foster a more active environment for the students to participate within.
5. Access to automatic pre-assessment and course assessment that will allow the students to receive instant feedback on their own learning.

The WBISS has the potential to be a powerful tool in meeting the college's vision for the General Education (Appendix 4) requirements and the department's ability to

meet the goals of the Society for College Science Teachers (Appendix 3). In order for the WBISS to be an effective educational tool, a careful front-end analysis must take place in order to identify specific student need, potential content prerequisites, plan non-instructional interventions, determine required and available resources, and help to plan the evaluation of a successful implementation of the WBISS. The front-end analysis and planning of the WBISS project is crucial.

The department has to carefully plan for the front-end analysis. The group of faculty assigned to the project has to be able to thoroughly answer the questions that will arise during the different parts of the front-end. In completing the front-end analysis, the department may find that there are some strong non-instructional solutions. Harless (1970) identifies three areas that the department should study in order to identify problems and solutions. The department must look at environmental deficiencies, motivational/incentive deficiencies, and skill or knowledge deficiencies during every analysis step that is completed. The WBISS offers the department the ability to potentially have an effect on each of those three areas; however, the skill and knowledge deficiencies will provide the most instructional solutions for the WBISS. The actual addition of the WBISS may help students bridge environmental barriers for the students. Also, in providing personalized and active content with the WBISS, the students may be able to increase their motivation and satisfaction with the course.

Proposed Front-End Analysis Plan

Robert Diamond (1998) suggests five categories of data (see Appendix 2) that should be collected in order to properly analyze educational gaps in the higher education

setting. Among these sources are 1) students, 2) society, 3) educational priorities, 4) content information, and 5) research. While this front-end plan will focus on collection of data from these sources, the front-end analysis will be separated into six separate categories of analysis. Figure 1 describes the general purposes for each of the following analyses that are to be performed: 1) needs assessment, 2) learner analysis, 3) technology/media analysis, 4) situational analysis, 5) content and objective analysis, and 6) extant data analysis.

Needs Assessment Component	
Needs Assessment	The needs assessment will focus on identifying current and ideal situations for the academic course in which a WBISS will be implemented. The goal for this front-end component is to identify the gaps between the current and ideal situations that are educationally relevant concerning the development of the WBISS.
Program/Institutional Analysis Component	
Type of Analysis	***Purpose***
Learner Analysis	Learner analysis will help the WBISS team to understand the "client" in the classroom. Various methods of analysis should focus on answering how the WBISS will help specific learners in their course performance. Learner analysis will also help to identify types of students that might require help with prerequisite knowledge or skills either in the content area or with the web-based instruction.
Technology/Media Analysis	This is an important process for the Web Author and Media Specialist. This step will highlight the various technologies and media capabilities. The team has to fully understand the technology capabilities at hand and use the institutionally provided resources to the maximum. This analysis should focus on hardware, firmware, media production capabilities, intellectual rights issues, and institutional training and support for technology.
Situational Analysis	This is an important type of analysis that tries to identify possible barriers to the use and implementation of the WBISS. The WBISS team has to look at what types of organizational, environmental, and technological factors could impede the implementation of the WBISS.
Content and Objective Analysis	Content and objective analysis should include another round of goals analysis (first round from the needs assessment). The goal of the content and objectives analysis is to start creating the framework for the message for the WBISS. Content and objectives have to be examined based on the content and objectives of the actual course. Next, the content and objectives should be analyzed in order to increase their effectiveness in the web-based environment. Additionally, content analysis should be compared to learner analysis in order to determine what content would be best suited for individualized attention in the web-based environment.
Extant data analysis	This is another method for identifying and correlating content with student achievement. This analysis may help answer questions about what content will need extra attention, what content could be individualized?

Figure 1 – Front-End Analysis Plan

Within the context of each of these analyses, the department and WBISS designers will be exploring collected or existing information in order to determine what educational gaps are created based on the desired outcomes for the course and present outcomes of the course. The front-end is critical to the design, development, and implementation of the WBISS because the front-end focuses on finding out what educational problems truly exist. The definitions of these problems will help the team of WBISS creators implement the highest quality web-based support system.

Assumptions

There are several assumptions for the front-end plan at this point. First, this front-end plan assumes that the course does not have some form of a WBISS already in place. This does not imply that this front-end plan will not work if there is some form a WBISS in place. In fact, if there is already a WBISS in place, it may provide good and usable data about effective delivery methods.

This front-end plan also assumes that the department implementing the WBISS has a certain organizational structure for the course. Many large courses have two to three large lecture sections that are led by one or more lecturers. Students usually participate in a lab section, so the course might have twenty or more lab sections taught by several lab instructors. Additionally, departments may employ graduate assistants, teaching assistants, and tutors for the course. These three levels of instruction are important considerations for defining WBISS objectives and specific learning outcomes.

Finally, this front-end plan assumes that a team (henceforth, the FEA team) will conduct the front-end analysis. This is important for a few reasons. Most importantly, a

team will be able to provide multiple perspectives for data collection and questions that have to be answered. A team will reduce the overall burden that one person might incur conducting a front-end analysis. Finally, a team will help reduce individual bias in the data collection process.

Components of the Front-End Assessment Plan

Needs Assessment

The needs assessment actually includes components of analyses that will be described in following sections. The main purpose of the needs assessment is to identify the actual gaps that exist in the current course as it exists before the implementation of a WBISS. In terms of a college science course, a needs assessment breaks down to identifying the expected outcomes for an individual in the course and the actual outcomes that are experienced by the students in the course. The expected or ideal outcomes for the course come from a conglomeration of different perspectives. The front-end analysis must take into account the following perspectives: goals of professional societies, requirements from the local or professional communities that the students will serve, goals of the department that offers the course, goals of the departments or colleges from which students of the course will be from, and content or process knowledge for the course. Analysis of all of these groups might be arduous and might yield an excess of data.

In order to be able to define educational gaps, a WBISS team could analyze mission statements from other departments, majors, the colleges and institutions, and

professional societies. The mission statements or visions could be reduced into manageable chunks of more individualized goals. These goals could then be compared with a goal analysis that focused on the faculty in the department creating the WBISS.

The following example details how the goal analysis could be used to identify gaps in an existing course. The WBISS committee could gather statements of mission or vision from various groups that would be concerned with the outcome of the course. Appendix 3 provides the Goals for Introductory Science Courses from the Society of College Science Teachers and Appendix 4 contains excerpts from a SUNY Cortland mission statement and general education requirements. One rationale for examining these documents is that the course for which the WBISS will be created is an introductory college science course that fills the college's general education requirements.

The goals that are distilled from the analysis of mission and vision documents would be fed into a modified Delphi process that would determine the goals of the faculty involved with the course. First, instructors for all levels of the course will be asked to list the ten most important goals for the overall course experience. The FEA team will then select the top twenty or so goals. This list will be sent back to the faculty members for the course and the faculty will be tasked with ranking the goals in order of importance. This process of iteration and ranking might continue for one or two rounds. The FEA team will then have a list of prioritized goals for the course. These goals have to be reconciled with the institutional and departmental goals from the review of mission and vision statements.

This goal analysis provides the FEA team with the information that will stand as the ideal or desired educational outcome for the course. The process that was used to gain

this information allows for the FEA team to build consensus about the course outcomes using a modified Delphi method. Use of the Delphi method in order to build consensus helps to prevent disagreements that might result from the direct negotiation and ranking of goals.

The desired educational outcomes from the course can now be compared to the actual outcomes from the course. Actual outcomes from the course can be determined several different ways. The FEA team could survey students that have just finished the course and school alumni. This data could be compared to extant data about student performance in the course and extant course evaluations completed by the students. The analysis of the gaps between the existing outcomes and the desired outcomes will provide the basis for goals and objectives for the WBISS.

The educational gaps that are described as a result of the needs assessment will drive the formation of goals and objectives within the course and the WBISS. The needs assessment data will also help to inform the additional analyses.

Learner Analysis

Understanding the learners that will be taking a course is one key towards selection of quality methods and production of good materials. In understanding general and emerging characteristics of a group of students over time will allow the WBISS design team to select and implement instructional strategies that are more likely to fit in with the characteristics that learners display over time.

Initial learner analysis should focus on extant data analysis. For example, the FEA team should have access to several years of data from course assessment and evaluation.

The course assessment information should provide information about the various majors for students, age level, and maybe some type of biographical information. This information is important for predicting which students may need help with learning prerequisite information in the course.

Preexisting student evaluations of the course may be helpful in defining some content portions of the course that need improvement or might benefit from treatment with the WBISS. Perhaps a better tool for collecting this data would be the formation of Student Course Evaluation Committees (see Appendix 5 for full details). These committees will provide very informative evaluations that can serve two purposes. The committee can help inform faculty about the condition in the current course. This would allow the faculty to revise the course before any revision takes place. These evaluations can also provide the FEA committee with valuable information about the students. This evaluation data will provide the FEA team with highlights about 1) good and effective instructional methods, 2) prerequisite content deficiencies, 3) difficult content areas, and 4) felt or expressed needs that the students have for the course.

The use of the Student Course Evaluation Committees may be difficult to establish, but the reward is in the extensive data that the committees will produce. Students have an opportunity to take ownership of their learning. This allows students more actively and personally to participate in their education.

Technology/Media Analysis

The technology analysis will provide the WBISS team information about the existing technology that the department or institution has to offer. This analysis will serve

to limit the application and implementation of the WBISS based on existing resources. This analysis may also show that the department or institution has to acquire new technologies. The technology analysis must examine seven crucial aspects of existing technology: 1) communication technology, 2) existing reference materials, 3) testing and assessment capabilities, 4) alternative delivery methods, 5) delivery and implementation, 6) existing knowledge management systems, and 7) media production capabilities (see Appendix 6 for more detail, Appendix 7 shows a potential interview/survey instrument).

The collection of this data can be completed in two ways. The FEA team can design a survey or conduct interviews of the media and technology staff either within the department or institution. Interviews, although more difficult to complete and transcribe, may be more effective. This would be due to the personal attention that comes from an interview. Potential respondents for a survey might be likely to discard the survey.

In either case, the instrument for data collection might look like the checklist in Figure 2. The interviewer or survey respondent would indicate the availability of the technology in question and the capabilities of the technology. The responses to this survey or interview will be directly related to the ability to implement different aspects of the WBISS.

Technology Use	***Existing Technology***	***Availability***	***List the Capabilities***
Communication Technologies	E-Mail	YES	Students must request email, Attachments have file size limitations
	Chat-Rooms	NO	N/A
	Discussion Boards	YES	Centralized, Must be watched by an instructor
	Listservs	YES	Teachers must enroll class, E-mail must be monitored

Figure 2 *– Example of one part of a technology analysis tool (based on Lee and Owens, 2000). The red represents potential response. A complete sample interview/survey instrument can be seen in Appendix 7.*

A knowledge management system might be an effective way to incorporate many different technologies into one centralized and prepared focal point for the WBISS. While a knowledge management system (e.g. WebCT, Blackboard.com) might present an attractive front-end for the delivery of a WBISS, the use of a knowledge management system should not be considered as a complete solution. It may be possible to use WebCT at the front-end for the implementation of the WBISS. In fact, this may minimize the WBISS workload in the long run. However, the WBISS must still follow an instructional design and development scheme. Simply posting lectures and having reviews online will not serve the intended purpose of the WBISS.

Situational Analysis

Situational analysis should be completed in this context in order to examine the possible barriers to the successful implementation and usage of the WBISS. The methods for collecting this data are similar to the technology/media analysis, however the audience is different. In the situational analysis, the students should to complete a survey. Additionally, or instead of a survey, a representative sample of students could be interviewed in order to determine the barriers to WBISS usage. Unlike the technology analysis, in the situational analysis, the survey should work well due to the large number of students in the course. In addition to a survey, a literature review could be conducted in order to determine other barriers that have already been encountered. The literature review could focus on student attitudes about web-based instruction and physical or institutional barriers that may exist.

Understanding the barriers that may arise is important information for the FEA team to have. Knowledge may already exist about effective and ineffective methods of online instruction. In addition, knowing about possible methods of preventing failure should help the FEA team trouble shoot problems before they arise in the development of the actual WBISS.

Content and Objective Analysis

Based on the goals analysis from the needs assessment, the course faculty members have already identified the overall goals for the course. The content and objective analysis will help define the subject matter for the course. In order to determine what the subject matter should be for the course, the FEA team has to investigate several sources: 1) course faculty as subject matter experts, 2) professional societies recommendations, and 3) literature about effective subject matter presentation.

In order to define the content for the course and the WBISS, a topic analysis will be conducted. The topic analysis will focus on the course lecturers and lab instructors as the subject matter experts (SME) for the content. The topic analysis could be conducted with several methods. The most difficult and intensive method would involve a modified Delphi in order to gain consensus on the content. The FEA team could also conduct interviews or hold a focus group in order to determine the content that meets the goals already defined for the course and the WBISS.

In addition to the topic analysis completed by the SMEs, the FEA team should also examine extant data in the form of a literature review. Current literature might have some predefined content and/or content sequences that have proven to be effective in

large courses. Additionally, professional societies like the NSTA (National Science Teachers Association) or the SCST (Society of College Science Teachers) publish position papers that might have research supported content goals or objectives that might prove helpful in the selection of course and WBISS content.

If the existing course is not going to be revised, then the content is already defined for the FEA team. In any case, after the content has been defined for the course, the FEA team needs to compare the content selection with the results from the needs assessment, the learner analysis, the technology/media analysis, the situational analysis, and the extant data analysis. This step should highlight the course content that would be best implemented in the WBISS. This would include any content that requires: 1) prerequisite knowledge, 2) active engagement either with the instructor or a collaborative group, 3) group or discussion activities, 4) regular assessment or pre-assessment. The list of possibilities goes on. The basic idea is that the content selected for treatment in the WBISS should meet the goals of the WBISS.

Extant Data Analysis

This extant data analysis component is similar to and could be completed with several of the other stated analyses. This extant data analysis is listed separately to emphasize the importance of this particular data. The extant data that the FEA team is interested in collecting for this analysis is extant data that would correlate specific content in the existing course that students have a deficiency in.

One purpose of the WBISS is to help students with prerequisite knowledge that is necessary for success in the course. The FEA team should conduct a document analysis

of prior tests, quizzes, and student writing assignments in order to determine which content areas the students are deficient in or have a hard time comprehending. Additionally, the FEA team should examine literature to identify content topics that have already been identified as difficult for students.

This extant data analysis is very similar to components of the learner analysis and the content and objective analysis. In fact, this extant data analysis could be conducted under those analyses. The important outcome of this extant data is the shaping of tutorials and simulations within the WBISS.

Summary

An FEA team should complete six separate analyses: 1) needs assessment, 2) learner analysis, 3) technology/media analysis, 4) situational analysis, 5) content and objective analysis, and 6) extant data analysis. Each component contributes to the overall goal of designing a clear and effective WBISS. Through careful planning, the front-end analysis will provide key information about goals for the WBISS, learner characteristics that will be effectively utilized in the WBISS environment, and appropriate content for the WBISS. While the intended goal of the front-end analysis for the WBISS is clarification of educational gaps, the potential is available for non-instructional gaps and solutions to arise. In order for the WBISS to be completely effective, these non-instructional goals must be addressed in the implementation of the WBISS. The careful planning of the front-end analysis and the thorough completion of the FEA plan is a crucial first step in the implementation of a successful WBISS.

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Appendix 1 - Front – End Assessment Plan

Needs Assessment Component	
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Type of Analysis	***Purpose***
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Technology/Media Analysis	This is an important process for the Web Author and Media Specialist. This step will highlight the various technologies and media capabilities. The team has to fully understand the technology capabilities at hand and use the institutionally provided resources to the maximum. This analysis should focus on hardware, firmware, media production capabilities, intellectual rights issues, and institutional training and support for technology.
Situational Analysis	This is an important type of analysis that tries to identify possible barriers to the use and implementation of the WBISS. The WBISS team has to look at what types of organizational, environmental, and technological factors could impede the implementation of the WBISS.
Content and Objective Analysis	Content and objective analysis should include another round of goals analysis (first round from the needs assessment). The goal of the content and objectives analysis is to start creating the framework for the message for the WBISS. Content and objectives have to be examined based on the content and objectives of the actual course. Next, the content and objectives should be analyzed in order to increase their effectiveness in the web-based environment. Additionally, content analysis should be compared to learner analysis in order to determine what content would be best suited for individualized attention in the web-based environment.
Extant data analysis	This is another method for identifying and correlating content with student achievement. This analysis may help answer questions about what content will need extra attention, what content could be individualized?

Appendix 2 - Summary of Diamond's (1998) Suggested Front-End Data for Course Revision

Sources and Types of Data

Students	a. Entering level of competence b. Ability to meet assumed prerequisites c. Goals, priorities, majors d. Reasons for enrolling and background e. Attitudes about discipline, area, and so on f. Assumptions about course or program
Society a. Employers b. Recruiters c. Alumni d. Community Leaders	a. Basic competencies all students should have by graduation b. Career-specific requirements c. Existing gaps between competencies and abilities of graduates
Educational Priorities	a. Mission of institution, department, or program b. General goals of the program (course)
Field of knowledge	a. Required/essential content b. Future trends in discipline/area of focus c. Accreditation requirements (professional programs, state) d. New content areas
Research	a. Discipline-related b. Pedagogy (teaching and learning)

Appendix 3 - Goals for Introductory Science Courses from the Society for College Science Teachers (from Siebert, et al 1997)

- Use the language and concepts of science appropriately and effectively in written and oral communication.

- Use the methodologies and models of science to select, define, solve, and evaluate problems independently and collaboratively.

- Adequately design, conduct, communicate, and evaluate relatively basic but meaningful experiences.

- Make scientifically based decisions and solve problems drawing on concepts and experiences from relevant areas.

- Evaluate critically: evidence, interpretation, results, and solutions related to the course content within a real life context.

- Explain scientifically related knowledge claims as products of scientific inquiry process that, while diverse in scope, conforms to the principles of logical reasoning.

- Demonstrate research skills necessary to access needed data to support scientific inquiry.

- Ask meaningful questions about real world scientific issues and conundrums.

Appendix 4

SUNY Cortland, Excerpts from Mission Statement

Our students gain skills, knowledge and conceptual understanding in their discipline; furthermore, they grow intellectually and acquire fundamental life skills and values. Among these are a desire to learn, an ability to think critically, an awareness of the excitement of discovery, an appreciation of diversity, and a respect for physical and emotional well-being. Our students are immersed in a broad-based general education program, develop oral and written communication skills and acquire an aesthetic sensibility. All students have opportunities to develop and utilize technology in their studies while also assessing the impact of technology on individuals and society.

Excerpts from SUNY Cortland General Education Guidelines:

PURPOSE:

The purpose of a general education is to provide students with an intellectual and cultural basis for their development as informed individuals in our contemporary society. This requires that they understand the ideas that have formed our own civilization, that they appreciate other cultures, and that they have knowledge of the fundamental principles that govern the physical universe.

Appendix 5 - Front End Tool: Student Course Evaluation Committees

Tool Label:

Student Course Evaluation Committees (based on a Formative Evaluation scheme)

References and Resources:

Rossett, A. (1987) Training needs assessment. Englewood Cliffs, NJ: Educational Technology Publications.

Jonassen, D. H., Hannum, W. & Tessmar, M. (1999) Task analysis methods for instructional design. Mahwah, NJ: Lawrence Erlbaum Associates.

Dick, W. (1980) Formative evaluation in instructional development. JID: 3(3), 3-6.

Primary Purpose:

Allows user to conduct a needs assessment and learner analysis to directly evaluate existing courses or curricula in order to create new or revised course or curriculum plans.

Allow for collection of data over time in order to refine the student need description and determine relevant expressed and felt needs that can be addressed in redesign of curriculum.

Allow for students to contribute input into the design and development of courses and curriculum.

Student course evaluation committees have the ability to turn ineffective and negative criticisms from students into effective course evaluations and needs assessment data.

Student committee members have a chance to develop professional leadership skills and possibly earn education or leadership credits for their participation.

Comments:

Why use an evaluation scheme?

Understanding students and student needs as they relate to their primary and elective coursework is important in planning both courses and curricula. Most faculty or course evaluations are based on short and narrow summative evaluation data collected either just before or at the end of a course. Much of the data that are collected are irrelevant for the purpose of revising or creating new and meaningful instruction. Often students provide only negative criticism and speak overly broadly about a course.

This, however, does not devalue the impact that students can and should have on the courses that they take or the curriculum in which they participate. A proposed student formative evaluation committee would consist of several students from a current course, series of courses, or even from an entire curriculum (e.g. a college major or minor). The students would meet over the length of the course and discuss their comments and concerns about the class AND act as representatives for the larger class. Students would be guided on how they could turn their insight into positive and constructive data that could generate important leaner analysis for reconstruction or revision of a course.

Evaluation usually occurs after the planning and implementation of instruction. By employing a well-designed formative evaluation plan, curriculum committees will receive data about existing instructional plans. Curriculum committees will also have access to data about learner needs already available in the event that a new instructional plan will be designed.

Why use a formative evaluation scheme instead of a summative evaluation scheme?

	Summative Evaluation	Formative Evaluation
What is the time frame for the course evaluation?	At the end of a course	Ongoing
Types of data that are collected	- Retrospective - End achievement - Results - Evidence	- Prospective - Strengths and weaknesses - Feedback

As this small chart shows, formative evaluation provides ongoing evaluation about a course. The data that are collected might be much more useful when conducting a learner analysis and identifying student needs. Also, the ongoing nature of formative evaluation makes students focus on the course as the course unfolds. Summative evaluation might not be as helpful because student reflections about the course may not be as complete or focus on problems that were temporal earlier in the course.

Benefits of a Student Evaluation Committee:

Increase student participation.

Students take ownership of their learning environment.

Faculty develop a strong base of suggestive and positive feedback for decision-making.

Weaknesses:

This is a time consuming process.

Students might not want to be involved for a number of reasons (time, credit, fear of retribution).

Potential Implementation of the Tool:

The best way to discuss the implementation of a Student Course Evaluation Committee is to provide an example of how the committee might work. The following example is based on a college department that offers a two-part introductory level course. This course sequence fills a general education requirement for the college and receives a large enrollment on a yearly basis. For the purposes of this example, part one of the course will be offered in the fall semester and part two is a spring semester course.

Department X decides that they are going to revise their current introductory course offering. The entire faculty is supportive of the revision. Department X seeks to revise the course offerings in a one to two year time frame.

Overall, student need is not very well understood by the faculty. Upon examination of several years' worth of summative course evaluations, some concerns about student need are noted. There is little consensus about student need, especially in regards to how this sequence of courses is related to students' needs for their own major. The majority of the data collected by the evaluations is punitive towards certain instructors. Many of the comments do not offer a constructive basis to support change.

In order to better understand the needs of the students that participate the course, Department X decides to form a Student Course Evaluation Committee (SCEC). The SCEC consists of several students that are asked to participate. The makeup the students selected for the SCEC is based on cursory observations in the first few weeks of classes. The committee is selected to have several students that perform average, several students that perform above average, and several students that perform below average.

The students involved with the SCEC initially meet with the professor and graduate assistant that are in charge of conducting the learner analysis for the project. This initial meeting takes place about two weeks into the course. This meeting consists of several tasks. First, the committee selects four times to meet during the semester. Next, the professor and the graduate student outline the roles and goals of the committee members:

1. Serve as speaker for all of the students in the course.
2. Evaluate the instructional methods of the instructor or instructors that teach the course.
3. Evaluate the content in the course and how it relates to the members of the committee and to the rest of the students in the course.
4. Develop a method for converting criticisms and comments into constructive prescriptive statements.
5. Complete several evaluations of the course based short spans of course delivery (e.g. prepare a evaluation that coincides with every two or three units of instruction).
6. Deliver a completed executive summary of main concerns and the smaller evaluations of units to the course revision committee at the end of the semester.

The students then elect a leader that will serve as a representative to the department. For the rest of the semester, the graduate student serves as the facilitator for the group.

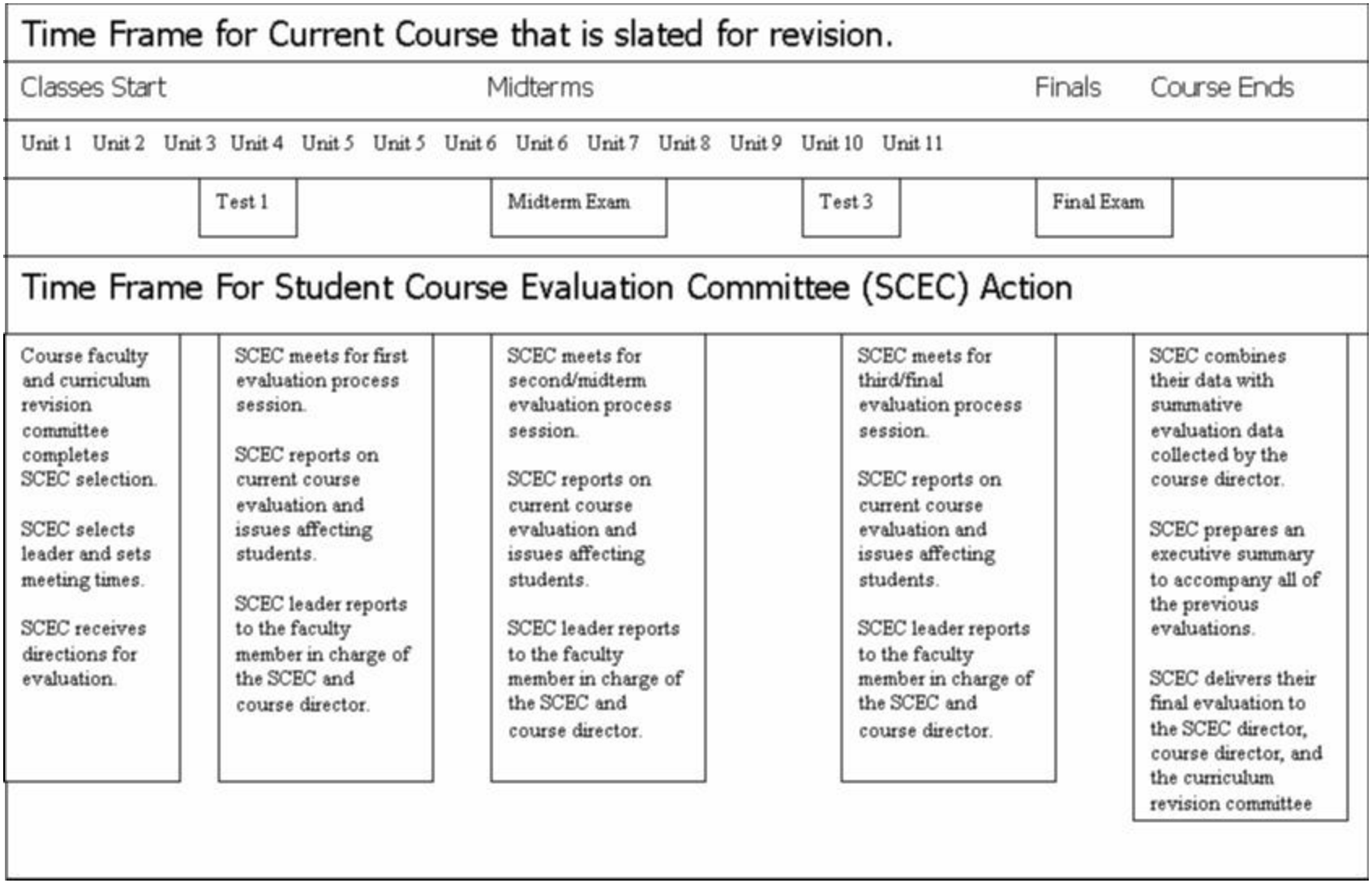
This tool allows for flexibility in the implementation of the data collection. The facilitator has several methods that could be employed in order to collect the data. Several examples would include detailed surveys that make the students look deeper into the current content in the course than a summative evaluation at the end of a course. The facilitator could conduct focus groups at every meeting of the SCEC in order to guide the students into the "right" direction. The facilitator could conduct interviews with the SCEC or the facilitator could just observe the meetings. This flexibility allows the user of the tool to become very involved or just stand as a witness to the process. Certain applications of the tool could be very time consuming.

Department X will probably need to offer the students some incentive based on the amount of time and effort the students apply to the SCEC. This is an important dilemma to consider before implementing this tool. The students will be gaining several types of experience if they sit on the SCEC committee. These experiences include:

1. Educational Leadership
2. Professional Teamwork
3. Project Management
4. Teamwork Skills

Any of these skills could be packaged into a one-credit course for which the members of the SCEC could receive credit. For example, if Department X was a Department of Biology, the members of the SCEC could receive one credit hour for "Educational Leadership in Biology." Credit offerings like this may be very attractive for any student that needs to have professional skills as part of a resume, students that plan on majoring education, or students that seek management experience for their major.

The above stated incentives would require a certain amount of faculty commitment and administrative support. The benefits of conducting this sort of learner analysis is crucial when looking into the minds of the students that college educators serve. This evaluation scheme would be time consuming, but has the potential to increase student and faculty awareness. Faculty will gain a new respect for a more constructive and prospective evaluation while the students on the SCEC will gain valuable leadership, management, and professional skills as a result of the project.


Time Frame for Current Course that is slated for revision.
Classes Start
Midterms
Finals
Course Ends
Unit 1 Unit 2 Unit 3 Unit 4 Unit 5 Unit 5 Unit 6 Unit 6 Unit 7 Unit 8 Unit 9 Unit 10 Unit 11
Test 1
Midterm Exam
Test 3
Final Exam
Time Frame For Student Course Evaluation Committee (SCEC) Action
Course faculty and curriculum revision committee completes SCEC selection.
SCEC selects leader and sets meeting times.
SCEC receives directions for evaluation.
SCEC meets for first evaluation process session.
SCEC reports on current course evaluation and issues affecting students.
SCEC leader reports to the faculty member in charge of the SCEC and course director.
SCEC meets for second/midterm evaluation process session.
SCEC reports on current course evaluation and issues affecting students.
SCEC leader reports to the faculty member in charge of the SCEC and course director.
SCEC meets for third/final evaluation process session.
SCEC reports on current course evaluation and issues affecting students.
SCEC leader reports to the faculty member in charge of the SCEC and course director.
SCEC combines their data with summative evaluation data collected by the course director.
SCEC prepares an executive summary to accompany all of the previous evaluations.
SCEC delivers their final evaluation to the SCEC director, course director, and the curriculum revision committee

Appendix 6 - Components of Technology Analysis

Determine:	Examine:
What communication tools are available?	- Email Systems - Chat-room Capabilities - Discussion Groups, Newsgroups, and Bulletin Boards - Listserv Access
What references and online tools might already exist?	Look for existing web sites and tools that include: - Tutorials - Simulations - Web quests - Media Databases - Links
What tools are available for testing assessment?	HTML programming vs. JAVA vs. Software packages for testing and Assessment (e.g. Shockwave) Existing online assessments Other issues: - Security of information - Validation of user
What are additional methods for WBISS delivery?	CD-Rom Video Audio Downloads
What are the WBISS delivery capabilities?	What are file size limitations? What are server limitations? What are the institutional web access limitations, capabilities, and policies?
Are knowledge management systems or authoring software available?	- WebCT - Blackboard.com - Authorware
What are the media production capabilities?	Are there existing 1) personnel, 2) hardware, 3) equipment, and 4) software that will help in the development and /or production of: - Audio - Video - Graphics - Help systems - Web/Computer instruction - Databases

Appendix 8 - Sample Technology/Media Analysis Survey or Interview Instrument (adapted from Lee and Owens, 2000)

Technology Use	***Existing Technology***	***Availability (Yes or No)***	***List the Capabilities***
Communication Technologies	E-Mail		
	Chat-Rooms		
	Discussion Boards		
	Listservs		
Existing Reference Materials	Web Sites		
	Databases		
	Web Quests		
	Tutorials		
	Software		
	Books		
	Journals		
	Videos		
	Media Libraries		
	Abstracts		
	Course Notes		
Testing and Assessment Capabilities	Self-Assessment Databases		
	Question Banks		
	Online Tutorials		
	Existing Verification Procedures and Policies		
	Existing Validation Procedures and Policies		
Alternate Delivery Methods	CD-Rom		
	Disk		
	Video		
	Audio		
	Download		
Delivery and Implementation	Server Technologies		
	File Type Limitations		
	File Size Limitations		
	Institutional Policies		
Knowledge Management Systems	Are systems available?		
	Are authoring packages available?		
Media Production Capabilities	Audio		
	Video		
	Graphics		
	Help-Systems		
	Web/Computer Instruction		
	Databases		

Appendix 8 – Front-End Analysis Plan with Tools and Methods

Type of Analysis	*Purpose*	*Tools for Analysis*	*Methods of Data Collection*	*Source of Data*
Needs Assessment	The needs assessment will focus on identifying current and ideal situations for the academic course in which a WBISS will be implemented. The goal for this front-end component is to identify the gaps between the current and ideal situations that are educationally relevant concerning the development of the WBISS.	Goal Analysis	Document Analysis - Mission Statements (Colleges & Departments) - Position Papers (Professional Societies) Modified Delphi of Goal Analysis for Course Faculty	Educational Priorities Field of Knowledge Research Society
Learner Analysis	Learner analysis will help the WBISS team to understand the "client" in the classroom. Various methods of analysis should focus on answering how the WBISS will help specific learners in their course performance. Learner analysis will also help to identify types of students that might require help with prerequisite knowledge or skills either in the content area or with the web-based instruction.	Extant Data Analysis Student Evaluation Committees	Extant Data Analysis & Document Analysis - Student Performance Records - Student Course Evaluations - Department Enrollment Statistics Interview Focus Groups Survey Observation	Students Research Society
Technology/Media Analysis	This is an important process for the Web Author and Media Specialist. This step will highlight the various technologies and media capabilities. The team has to fully understand the technology capabilities at hand and use the institutionally provided resources to the maximum. This analysis should focus on hardware, firmware, media production capabilities, intellectual rights issues, and institutional training and support for technology.		Survey or Interview	Society (Institution) Educational Priorities Research

Situational Analysis	This is an important type of analysis that tries to identify possible barriers to the use and implementation of the WBISS. The WBISS team has to look at what types of organizational, environmental, and technological factors could impede the implementation of the WBISS.	Extant Data/Document Analysis	Survey or Interview Literature Review	Society (Institution) Educational Priorities Research
Content and Objective Analysis	Content and objective analysis should include another round of goals analysis (first round from the needs assessment). The goal of the content and objectives analysis is to start creating the framework for the message for the WBISS. Content and objectives have to be examined based on the content and objectives of the actual course. Next, the content and objectives should be analyzed in order to increase their effectiveness in the web-based environment. Additionally, content analysis should be compared to learner analysis in order to determine what content would be best suited for individualized attention in the web-based environment.	Topic Analysis Extant Document Analysis	Subject Matter Expert: - Interviews - Focus Group - Modified Delphi Method Literature Review of: - Position Papers - Previous Content Analyses	Educational Priorities Field of Knowledge Research Society
Extant data analysis	This is another method for identifying and correlating content with student achievement. This analysis may help answer questions about what content will need extra attention, what content could be individualized?	Extant Data Analysis for Learner Analysis	Document and Data Analysis of Student Achievement Literature Review	Research Society Students Research Field of Knowledge