University of Washington
Office of Educational Assessment
Program Evaluation Division

Hands-On Laboratory-Driven Electrical Engineering Curriculum (Pandora)

Progress Report – Year Two

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INTRODUCTION

The goal of the Hands-on Laboratory-driven Electrical Engineering Curriculum Program (Pandora) is to create distance learning curriculum to address the need for skilled workers in electrical and computer engineering. The curriculum is distinguished by its use of initial motivating experiments, student interaction and collaboration, and reasonably priced instrumentation tool kits. Funded by the Fund for Improvement of Postsecondary Education (FIPSE), the courses are aligned with the Accreditation Board for Engineering and Technology (ABET) learning outcomes and target students in two-year and four-year institutions and those who are in geographically remote communities.

The second year of the Pandora project has continued to include monthly meetings of the project team to track progress and to provide a venue for communicating developments and clarifying strategies. The team has been developing course materials, reviewing and revising the online curriculum, and continuing the process of creating a lab kit at a reasonable cost. The second year was also the pilot year for the first course, EE 215.

The University of Washington Office of Educational Assessment (OEA) has been asked to evaluate the project. Four major evaluation processes have been undertaken this year:

1) instructor interviews (summer 2001)
2) Survey of students regarding handbook materials (summer 2001)
3) Focus group with students who reviewed the online materials (fall 2001)
4) Interviews with students at the beginning and end of the online EE 215 course (spring 2002)

All evaluation instruments are included in the Appendix of this report. After each process, the evaluators presented the results to the Pandora team and appropriate changes were discussed.

Instructor Interviews

To obtain feedback on student use of the Student Handbook and instructor use of the Faculty Handbook, the OEA conducted two interviews with the summer course instructor, who would also be the instructor for the online EE 215 course the following spring. The instructor felt that it was helpful that the handbooks were already prepared, were well-written and formatted for ease of use, and were tailored to the ABET outcomes. He reported that he read the handbooks at the beginning of the course and used the faculty handbook as advisory material to consult during the quarter as needed. He mentioned that it was not necessary for him to consult the handbook all the time, and that he developed and used his own class notes. In class, he most often presented a theory and then presented examples.

The instructor reported that at least half of the students were struggling with math concepts and computations, particularly with complex numbers. He described his teaching strategy as interactive, as students and the instructor did problems together in class. He used this strategy so he could see the students' problem-solving strategies. The instructor stated that the student handbook was on the class web site, but he was not sure if the students were using it as he had not asked them.

Survey of Students Regarding Handbook Material

The Student Handbook was developed as a resource to understand electrical engineering concepts. During summer 2001, EE 233 students were informed of the resources that had been developed for their use, including the student handbook. As part of the handbook revision process, these students were asked to complete a questionnaire (see Appendix) asking for their perceptions of the handbook as a guide to their learning.

Student response frequencies from the questionnaire indicated that only five out of twenty-seven students used the handbook as a guide for their learning (see Table 1). More often, students used the textbook as their primary resource, even though it had many errors.

Table 1

Student Use of Course Resources

N=27 (percent in parentheses)

1.	On average, how many **hours per week** have you spent on this course, including attending classes, reading, reviewing notes, completing activities, and any other course-related work?	Under 5	5-10	11-15	16-20	21 or More
		2 (7.4)	5 (18.5)	16 (59.3)	2 (7.4)	2 (7.4)
2.	On average, how many **times per week** did you use the **Student Handbook** as a guide to learning EE 233 topics?	Never	Under 5	5-10	11-15	16-20	21 or More
		22 (81.5)	5 (18.5)	0	0	0	0
3.	On average, how many **times per week** did you use the class textbook as a guide to learning EE 233 topics?	Never	Under 5	5-10	11-15	16-20	21 or More
		1 (3.7)	7 (25.9)	13 (48.1)	5 (18.5)	1 (3.7)	0
4.	On average, how many times per week did you contact the professor for help outside of class?	Never	Under 5	5-10	11-15	16-20	21 or More
		10 (37.0)	17 (63.0)	0	0	0	0

Students did feel the handbook was fairly well written, but gave lower scores for usefulness of the content (see Table 2).

Table 2

Student Ratings of Aspects of Student Handbook

N=9 (percent in parentheses)		**1**	**2**	**3**	**4**	**5**	**Mean**
5.	The layout of the handbook was:	0	0	5 (62.5)	2 (25.0)	1 (12.5)	3.50
6.	The organization of material in the handbook was:	0	0	3 (37.5)	5 (62.5)	0	3.63
7.	The clarity of the narrative in the handbook was:	0	0	3 (37.5)	4 (50.0)	1 (12.5)	3.75
8.	The readability (ease of reading) of the handbook was:	0	0	3 (37.5)	4 (50.0)	1 (12.5)	3.75

9. The helpfulness of the handbook in understanding course material was:	0	1 (12.5)	5 (62.5)	2 (25.0)	0	3.13
10. The appropriateness of the examples in the handbook was:	0	0	6 (75.0)	2 (25.0)	0	3.25
11. The thoroughness of coverage of the content for each topic was:	0	2 (22.2)	4 (44.4)	2 (22.2)	1 (11.1)	3.22
12. The usefulness of the content in the handbook was:	0	1 (11.1)	4 (44.4)	4 (44.4)	0	3.33
13. The real world examples and explanations were:	0	0	7 (77.8)	2 (22.2)	0	3.22
14. The degree to which the handbook added to my understanding was:	0	1 (12.5)	5 (62.2)	2 (25.0)	0	3.13

In their open-ended responses (see Table 3), students stated that they had the most difficulty learning math concepts and completing the problems for the course. Students suggested including more sample, "real-world" problems in the handbook and less text. Two other suggestions students provided were (a) calling the handbook a *workbook* and (b) making the internet link to it more obvious.

Table 3

Student Open-ended Responses

N=27

15. What has been the most difficult aspect of learning the EE 233 material?
    - 7 – Math concepts/problems
    - 4 – Poor textbook/errors
    - 4 – Labs
16. How did the Student Handbook contribute your learning?
    - 6 – I didn't know there was one
    - 5 – I didn't look at it
    - 4 – It did not contribute
    - 1 – It helped me understand what EE is all about
17. What suggestions do you have to improve the Student Handbook?
    - 3 – Make the link obvious/clearer/rename
    - 2 – Less text and more sample/real world problems

Focus Group for Online Materials

On November 7, 2001, as part of the formative program evaluation process, the OEA conducted a focus group session with five undergraduate engineering students. The purpose of this focus group was to gather information about the new online EE 215 course materials.

Two weeks prior to the focus group, an OEA researcher visited a current on-campus EE 215 class to invite students to participate in the evaluation of the online curriculum. Students were informed that they would be viewing the online version of the course and would be asked to discuss their opinions and thoughts of it. Students were told that pizza and soft drinks would be provided after viewing the course for 30 minutes, and then they would participate in a 30-minute discussion to allow the OEA to gather information for web site improvement. Eleven students volunteered to participate in the review, two of which were female. Five male students attended the review session on the scheduled date. All five participants were undergraduate electrical engineering students currently enrolled in EE 215 on the University of Washington campus. It was felt that these students would be able to provide a unique

perspective on the online course materials because they were familiar with the content and were able to compare their in class experience with the online course.

In preparation for the focus group, Pandora Project team members, including OEA staff, UW EDGE staff, and EE professors, collaborated on topic areas and appropriate questions for the activity. An EE computer lab was reserved, as was an adjacent room in which to conduct the focus group. Email reminders were sent to the volunteer students a week before the focus group and the day prior.

Two OEA research assistants conducted the session that included viewing the web site for the online material and conducting a focus group with the student volunteers. The online curriculum viewing took place in an EE computer lab that was reserved for focus group participants. Prior to viewing the web site, students were provided with an informed consent form and a description of the project. They were asked to sign the form if they consented to participate. OEA staff also provided the students with a personal "note page" that would assist them in guiding their curriculum review and recording their observations (see Appendix). The students had 30 minutes to review the materials. The UW EDGE distance learning designer directed students to the web site and was present throughout the viewing to address technical difficulties. Due to time constraints, most students were only able to view the first three of the ten lessons.

After reviewing the online material, the UW EDGE staff member left and students were directed to the conference room to begin the focus group and enjoy their pizza. Prior to commencing the group, OEA staff reminded the participants that the group was confidential and no names or identifiers would be used in reporting results. Handwritten notes were taken, but there was no audio recording of the conversation. The focus group lasted approximately 40 minutes.

The focus group addressed the following semi-structured questions used to stimulate conversation among group members.

Does the site function well? Do links work? Do animations play correctly?

Participants reported that the site animation worked correctly and that they enjoyed this aspect of the site compared to their in-class demonstrations. Unfortunately, the URL for the main page was not working as planned, and there were technical difficulties with the site. Students had to manually key-in the lesson number in the URL each time they wished to access a lesson, which should have been a point-and-click process.

Participants believed that functioning links are very important for optimal site performance. One student noted that there was no link at the bottom of each page that redirects DL students to the top of the page to avoid scrolling. Students also reported that not all of the links were working, but dismissed this problem as they were aware that the site was still under construction.

Is the site navigation clear and consistent? Were you able to move easily though the lessons?

Students thought the site could be better organized by providing a table of contents and specific subject terms that correspond to each lesson. This table of contents would allow to students to move directly to the lesson of interest. They could then move to lesson terms and assignments quickly from

both the table of contents and the actual lesson using links. Students believed that each lesson should provide navigational links to other parts of the site in an effort to save time. This would allow them to use the mouse less frequently for scrolling.

Did the animations add meaning, clarify concepts, and extend your thinking OR did they distract you and not help very much? Which ones were most helpful and why?

Students responded positively to the animations included in the lessons they reviewed. Overall, the students thought the animations enhanced the functioning of the site. They believed that these were fun and a good way to teach concepts.

If you were to design a web-based version for this course, what else would it include?

Students suggested that an email link to the professor would facilitate student learning. They also suggested an exercise at the end of each lesson that included 20-30 problems and supplied answers and details of how to approach each question. All of the students wanted a thorough summary of key points and practical exams at the end of each lesson.

Students suggested an e-post format where they could send ideas and questions to a message board and discuss difficult concepts with other students taking the DL class, similar to a chat room.

Did you like using the online course materials? How did the experience differ from being in class? (both positive and negative differences)

Students expressed a good deal of concern regarding the process by which students taking this DL course would go about obtaining extra assistance on difficult concepts. They asked if each student was assigned a professor with whom to communicate throughout the duration of the course.

The students reported that they preferred an in-person lecture course as opposed to one online. The presence of a professor to answer questions immediately as they arise was one reason cited for this preference. Another reason for this was the interaction with the professors and other students and their enjoyment of listening to the lectures in class and seeing the professor in person.

Students expressed concern over the possibility of getting stuck on a concept in the DL course and having to wait several days to receive clarification from an instructor. They also mentioned that there is no way to tell on the web site what the most important concepts are for each lesson.

Is the material consistent with what you learned in your on-campus course? Did you notice any important material missing that was included in the on-campus course?

Students varied in their perceptions of the pressure analogy used in the first lesson. One student liked it, but another thought it would confuse students. Since the web site did not contain a definition for this concept, they believed this would be important to include.

Students pointed out that the bottom of the first lesson included a link to a lab. They were surprised that the lab followed the same format as their on-campus course and were concerned about how the

lab process would operate for DL students since their on-campus labs consist of group collaboration and teamwork.

Students also noted that for the questions that asked about number of nodes in Lesson 2, the pop-up answers did not make sense.

Another student concern was that Kirchhoff's Law was cited several times, but there was no definition given to explain the concept. They thought they would need more information to fully understand the concept.

What did you think of the writing style? What did you think of the informal comments that were included? Did you find these helpful, distracting, or difficult to understand?

Some students found that the writing style overall was too basic or simple. One student mentioned that the lesson text kept using the term "this is obvious" and found this wording offensive. “Repetition,” "beating around the bush," and "muddled" was mentioned when the subject of writing style was discussed. Other students were indifferent to the writing style and did not necessarily notice the informal language used in the text. Some students felt that the writing style in Lesson 2 was confusing due to the fact that sentences were choppy and the material presented did not seem to flow well.

How did the pacing of the lessons feel? Are the lessons too long or too short?

Students said it would take them 15 minutes to read through a lesson, which they believed was equivalent to two lecture classes. This made them feel as though they were missing critical thinking and learning opportunities. Another student said that he would actually take more time than an in-class lecture to absorb the online material and read it for understanding.

Would these materials be sufficient to learn from if you did not attend class?

Students believed that the online materials would be sufficient for learning, although not an optimal learning environment. They wanted to know if a textbook would be assigned for use with the online materials; they did not notice the textbook listed on the syllabus. They thought that the addition of a textbook and practical exams would be necessary for optimal learning through a DL course. It was not clear to students if the DL course would include exams and how this would be coordinated.

Students also stated that they believe they learn more from interacting with their fellow students than they do from a professor. They were concerned with how such group learning would take place in the DL environment. They also stressed the importance of DL students getting quick responses to their questions, just as they are able to get in an on-campus course, in order to be able to move through the material.

Did you find any typos or mistakes?

One student remarked that in Lesson 1 the diagram for the VCVS, voltage controlled voltage source, was incorrect.

A student also noted that in Lesson 1 the 4th diagram relating to passive sign convention had a mistake in it.

Several students noted that the lesson that discussed currents changing directions contradicted information they had read in their textbooks.

Other issues addressed by participants:

Students believed the online lessons were similar to their lecture notes. They also felt that a textbook is an important learning tool for the online material covered.

Students also wanted to know if it would be possible to videotape the lectures so that DL students could view them.

Conclusions from the Focus Group

- Students want to have control over the flow of information as they learn. It appears that wherever possible, students want to be able to click on an important term and get a definition. They also want to be able to skip to the place in the text where the term is used. The students suggested including a table of contents to ease navigation. They wish to avoid scrolling through the site as much as possible.

- Overall, the students observed that the site animation worked correctly and they enjoyed using it when reviewing the material.

- Students felt that exercises at the end of each lesson with explanatory notations should be included.

- Students were very concerned that DL students would have the benefit of group learning (whether through an online discussion or other means) and that they have access to a professor to receive prompt feedback.

- These students seemed to prefer in-class learning to the online materials. This perception might be because of a lack of experience with distance learning courses.

- It is important to note that the focus group included only five students, and these on-campus students' views may not be representative of DL students. On campus, 4-year college undergraduates may be more accustomed to group interaction and DL students may be more comfortable with less interaction.

Recommendations from the Focus Group

- It would be beneficial to have the web site proofread in order to identify spelling and grammatical errors as well as broken links and other site options that could impede student learning. This would aid in smoothing navigation through the site. Given that the OEA researchers were impressed with the insights and maturity of the undergraduate reviewers, it might prove beneficial to hire undergraduate reviewers to proof the DL materials.

- EE 215 professors also should review the website content for accuracy. The OEA researchers were not knowledgeable of electrical engineering concepts and could not judge the accuracy of students' responses concerning EE content.

- A priority is to make sure that DL students feel connected to an instructor and interact with other students. Possibilities for interaction include online discussions, e-post, chat rooms and interactive projects.

Interviews with Online EE 215 Students

As part of the evaluation the OEA conducted student interviews of those enrolled in EE 215 during the spring of 2002. Students were interviewed two weeks into the course and again during the final week of the quarter. The purpose of the student interviews was to gather feedback on course progress and development, as well as to reflect on the overall EE 215 experience.

All registered students were contacted by both phone and email to request an interview. At the beginning of the spring quarter, seven of the eight registered students were interviewed. Five out of seven remaining students were interviewed at the end of the quarter. All of the interviewed students were male. Two student interviewees reported having taken online distance learning courses previously.

Students were provided with informed consent information and a description of the project. They were asked to give verbal permission if they consented to participate in the interview. A copy of the consent form was mailed to each participant. Prior to commencing the interview, the OEA researcher reminded the participant that the interview was confidential and no names or identifiers would be used in reporting results. Handwritten notes were taken but there was no audio recording of the conversation.

Initial Course Interviews

Comments below are from the seven initial student interviews and reflect their impressions at the beginning of the course. Interview questions developed by the OEA in collaboration with Pandora staff (see Appendix) addressed the following topics:

Reasons for Enrollment

All students interviewed reported that they are full-time working professionals and were pleased that this course is available online. These students have neither the time nor the money to attend college full-time.

This course is seen as either a path to a Bachelors in Science in Electrical Engineering (BSEE), as background for a Masters in Science in Electrical Engineering (MSEE), to enhance professional requirements, or to review basic principles to see if they remain interested in an engineering career.

One student felt this course was easier to enroll in because he does not have to be an EE major to take it. He is looking forward to completing the series of courses as a path to a degree. Another student, who performed an Internet search for electrical engineering distance learning programs across the country, was impressed by the variety of methods employed in the Pandora Program and the accompanying lab kit.

Helpful Aspects of the Course

Several students commented that the web site is well laid out and clear; nicely suited to working at students' own pace. They also mentioned that they have felt sufficiently supported in their learning so far, but some mentioned that it is still early in the course. Several students commented that they felt comfortable contacting the professor. One student cited a recent email offer by the professor to meet on a Saturday or come in on Wednesday afternoon during office hours. Another student has received replies to his emails; his campus visit with the professor was very helpful and answered his questions.

Students reported that the course is not too different from what they expected. Two students reported that they found the videos helpful, but one commented that they were a little rough. He mentioned that he knows it is the first time for the course and is sure they will be improved. One student mentioned that the textbook seems to be thorough, and that information on the web seemed to be a summary. Several other students mentioned that the textbook was important for their learning. One student also noted that lab assignments were helpful for learning the material.

Problems Encountered with the Materials

Two students printed parts of the course (one likes to study from a paper version, one likes to read on his way to work). Both found problems with the printed version. Some figures were split at page breaks. They had to copy figures in pencil from the computer screen. The numbers/decimals were small and it was hard to be accurate; they were not sure if they wrote the numbers correctly. One student mentioned that he had found some "link" errors on the pages. He did let someone know and they have been fixed. One student bought the computer system requirements for the course, but could not view the course video clips even though he could download high speed clips.

When asked about particularly difficult topics at this point in the course, most students reported that they did not have significant difficulties with the material yet. However, one student reported that the part regarding how to assign polarity was confusing, claiming that the online material did not agree with the textbook, and added that circuit analysis with multiple sources was challenging. Two students mentioned the "quick ramp up" on math skills needed for the course. One student wanted more solved homework problems in the textbook to serve as demonstration problems.

One student commented that although the course has a variety of resources available to support student learning, "it doesn't seem like the class is making the best use" of them. He cited confusion over which homework problems were due on which date, and problems with correspondence between homework assignments and online lessons (i.e., some topics they had not covered online yet appeared on the homework) as examples. One student wanted clarity on what parts of the textbook they should read to correspond to the online lessons. Another student requested a course calendar with actual dates, not "week two." He did not realize he was already a week behind.

Problems Encountered with Interaction

One student mentioned that he did not think the first introductory session was efficient. It was more like a conference call in which each person waited for typing to appear on the screen. One student mentioned that the e-post discussion format was "clunky" and too slow for live discussion. Another student commented that it was difficult for him to make the mid-week online discussion session.

Receiving timely feedback on assignments was a problem cited by several students in the course. Two students were not sure how to submit homework and get it back. It had been mentioned that assignments should be submitted on e-post, but that process needs to be clarified. One student commented that he felt disconnected since he had turned in a homework and lab assignment the week prior but had not yet received feedback. He also mentioned that he was waiting on an email response from the professor and felt like he was "working in a vacuum." Another student also reported that they were not able to get feedback soon enough. For example, he mentioned that he had been FedEx-ing his homework and could not get solved problems back in time to help him prepare for the midterm. One student mentioned that most of the material was challenging for him and added that he had sent in several questions but had received responses from the professor that were too brief.

Suggestions from Students

- All of the students wanted more communication with the professor, other students, and the technical person. They thought communication was good at the beginning, but that it dropped off subsequently. They wanted online/real-time interaction with sound and video.

- Students wanted more detailed answers to their questions. Since the textbook does not have answers, they suggested having more student-to-student and instructor interaction scheduled at regular times. Students wanted confirmation that they are understanding the intricacies of course content.

- Students wanted pages to print out as they appear on the screen.

- One student wanted to receive clarification on what parts of the textbook should be read to correspond with the online lessons.

- One student would like more video clips. He commented that building circuits is difficult and viewing additional clips would be helpful.

- One student requested more solved homework problems.

- One student wanted to see the objectives for each lesson.

End-of-Course Interviews

Comments below are from the five end-of-quarter student interviews, and reflect their impressions at the end of the course. Interview questions (see Appendix) developed by the OEA in collaboration with Pandora staff addressed the following topics:

Helpful Aspects

Several students felt that the professor was available and accommodating throughout the course and felt comfortable contacting the professor if needed. One appreciated that the professor was flexible and accommodating with lateness of submissions. Another student was pleased that the professor was "accessible and very helpful." One student came to campus every Wednesday to attend the professor's

office hours in person. Another student reported that the few times he was able to meet with the professor in-person was very helpful.

Several students noted that the textbook was the most helpful aspect of the course for helping them to understand the material. One student mentioned that problem sets and homework assignments were helpful. Another student noted that the "web material was very well done. One student commented that that online lessons were "secondary, but helpful" to using the textbook."

One student kept in close email contact with another student as a means to support his learning.

Persistent Problems with Materials

At the end of the course, several problems with materials persisted. One student noted that reading assignments, labs, homework assignments, and topics on the midterm and final exams were "out of sync" at times. The syllabus still needed to be clarified to indicate what week students are working on. One student reported that he spent an inordinate amount of time looking for examples outside of the textbook in order to demonstrate concepts.

Material presented in the last week of the course (RLC circuits and RLC circuits with forcing function) was brought up as difficult for students. Several students reported that the last few chapters were more difficult than earlier parts of the course, yet they had less time to focus on this material. One student added that the textbook did not explain this material sufficiently.

Persistent Problems with Interaction

E-post format was problematic throughout the course. One student commented that although he was using e-post initially to communicate, the professor was not able to gain access to e-post for the last three weeks of the course and had to resort to email. Another student reported that he had to resort to using email to communicate after he had posted messages twice on e-post but did not receive a response.

Receiving feedback on student work seemed to be a critical problem. Problems cited with homework feedback included a delay in posting solutions and giving feedback, distorted images, and problems and assignments were disorganized at times. One student reported a good turnaround time on email responses from the professor but that the responses were limited to one to two lines. Another student reported that people wrote in a lot but only received "cryptic" responses from the instructor. Another student said that he was not receiving email responses from the instructor and that the professor told the students that it was "too difficult over email." The student said he had to take a couple of days off of work to see the professor during office hours. One student felt that assignments took longer due to lack of feedback. He explained that he would get "stuck on trivial things" that would take up a lot of time.

Students noted that a lack of homework feedback presented difficulties for learning the material. One student appreciated that the professor corrected and returned homework assignments within a few days of receiving them but felt that the postal delay combined with the fact that the professor could not possibly make extensive comments on every student's homework, as a persistent barrier to learning.

Students felt that the final was a lot harder than expected. One student commented that the final exam scheduled for June 7 included material that they had not received the homework and feedback on yet, and that they had not covered in the online course yet.

One student commented that if he had not taken advantage of the professor's office hours in-person every Wednesday "it would have been almost impossible for [him] to finish" the course. The same student was not able to access the online session and was reluctant to use e-post. Another student commented that although some students in the immediate area were able to meet with the professor, others were “kind of left to fend for themselves.”

Persistent Problems with Technology

One student commented that the web-based environment for the course was challenging and complicated. He added, "unless you have a mentor to guide you, a lot is gibberish. Another student noted that homework posted on the Internet was "almost impossible to read" and that items were incorrectly numbered.

One student reported that the web site had some incorrect information posted. He noted that there were only four homework assignments listed on the site but later found out that there were actually seven assignments due. At the end of the course he found himself working on two assignments at once.

Suggestions from Students for the Web Designer and Instructor

- One student, citing confusion over the number of homework assignments required felt that the course needs to be “more organized up front.”
- A student who commented that the first class meeting on E-post was the most successful, advised that they should fix e-post and have more simultaneous meetings throughout the quarter. However, another student who cited a problem with a firewall at work felt that there was an over-reliance on the chat program throughout the course. He recommended using a newsgroup rather than a chat program in the future.
- Have more interactive tutorials and quizzes.
- “Format materials for printing.”
- The textbook needs to provide solutions.
- The syllabus needs to focus more on later assignments. “Spend less time on the first two chapters and put more emphasis on the last two chapters that was two-thirds of the final.”
- Get homemeeting, netmeeting software to send diagrams
- Make sure that subsequent courses are available. It is a problem to wait for courses to be offered.

Students' Suggestions to Future Students

During the student interviews, OEA staff asked what advice they might give to future students who choose to enroll in the EE 215 online course. The following are their responses:

- "Get in touch with each other directly, early." and "Push harder in the beginning to form a support system with other students."
- "Make sure you have a lot of time." The homework assignments are very time consuming. Lab assignments were also time consuming and visiting the professor.
- "Gets as many other books for reference" as possible. Get PSPICE software and begin to work on it as soon as possible.
- "The course moves rapidly. Get homework [assignments] and labs done week one so you can focus on interaction with others the second week."
- "Make sure you know where you're at in the course."
- "Topics on the midterm and final are the most difficult concepts." Put more emphasis on studies just before the midterm and final.

To Enroll or not to Enroll

Asked in hindsight if they would have enrolled in EE 215, three of the five students interviewed replied "yes." Students had the following comments:

One student said that he probably would not have enrolled in the course knowing what he knows now because the time commitment was much bigger than he had expected.

Another student said that he still would have enrolled but does not plan to continue with the next online EE course because his interests are changing.

One student would have taken the course because he wants to get prerequisites out of the way so that he can get into the industry.

One student commented that "doing the course via distance learning was many times better than doing it alone, but still not as quality [an] experience as [being in a] classroom." The same student noted that "this was partly related to a lack of interaction with students and the professor." He added that the lab kit was a "neat tool" and felt that the course would be improved if problems were resolved. He plans to enroll in the next course in the series and feels that both he and the course will be more successful with the benefit of this experience.

Conclusions from EE215 Student Interviews

The fact that regardless of initial difficulties most students responded that they would in hindsight still enroll in the course, attests to the importance of providing EE distance learning opportunities. The students enrolled in EE 215 had neither the time nor the opportunity to take an on-campus course. Those

students who said they did not plan to continue with EE distance learning courses stated that they did so because their interests had changed. One student who said he would not have taken the course knowing what he knows now cited the fact that it was more work than he had expected as the reason.

While all of the participants appreciated the efforts of the instructor to make himself available to students, there are some concerns regarding distance learning objectives for EE 215. First, not all students can attend Wednesday afternoon sessions (online or in-person) without taking time away from work or other responsibilities. Although several students appreciate the offer extended by the instructor to meet in-person on the UW campus, it should be examined whether this option is counterproductive to distance learning goals. Students who live too far away or whose schedules do not permit such meetings are at a clear disadvantage to those who are able to come to campus or log on to an online session.

It is clear that a lot went into getting EE 215 up and running in time for spring quarter and it is understandable that a number of details are still in the process of being worked out. However, there were problems that occurred which would have been avoided had the syllabus been more detailed and organized. Students should not have been confused on such basic points as what week they were on in the course and how many assignments were due. Pacing also needed to be corrected to leave time for more challenging material toward the end of the course.

Recommendations for The Pandora Team

These students may have been away from higher education for an extended period an/or unaccustomed to distance learning courses. They should be given as much structure as possible to successfully navigate the course. For example, students should be told how often they receive responses to questions. For those who need a refresher before taking the course, faculty can point students to appropriate review material. As well, students need assistance with accessing course software and online communication and chat programs. Professors should be encouraged to continue to be flexible and accommodating with distance learning students who are most likely to have full-time jobs.

Faculty should be comfortable navigating the online environment. It would have been helpful for the professor to have be given more training and technical assistance prior to teaching the course. Homework and assignment feedback needs to reach student more expediently. If it is not possible to give students detailed online feedback, mailing homework back and forth should not be used as a substitute. Faxing materials would be preferable to mailing. The course syllabus needs to be clarified and exams should draw on material that has been covered and been given feedback on previously.

Distance learning courses must contend with isolation not merely from the professor but from other students. Whenever possible, students should be encouraged to develop supportive virtual relationships with each other while taking the course. The professor could require a certain amount of online group interaction weekly, including group projects and discussions. Perhaps students could write bios about their professional experience and why they are taking the course as a means to get to know each other.

It is clear that a great deal was learned by faculty and students regarding how to design and operate a course within the online environment. The professor should be encouraged share lessons learned with others who plan to teach online EE courses. As well, students who continue with the online EE sequence

could share their experience with new students to help assure the success of a virtual community of learners.

YEAR TWO -- CONCLUSIONS

The Pandora Program continues to be lead by a diligent, hardworking team. Throughout summer, fall, and spring quarters, a variety of evaluative methods have been used to determine whether the program is reaching its goals. Using the information from these evaluations is critical to improving online materials and course processes.

Pandora team members and online course instructors need to remain true to the original commitment of establishing a laboratory-driven curriculum that provides hands-on, interactive experiences. When problems arise, it is normal to shift back into an “on-site” mode of instruction because that is the most common experience. Using the expertise of UW EDGE staff to guide the pilot process of each online course will undoubtedly help to improve the outcomes.

At this time, the program is behind its intended schedule. By now, the program was to have piloted three courses, only one of which has been offered online. Team members need to use evaluative feedback from this year and adjust their planning to industriously develop and implement the next three courses.

APPENDIX

EE 233 -- SUMMER 2001

This questionnaire is intended to provide information for improvement of the Student Handbook for EE 233. Your response is voluntary and you may leave any question blank, but completion is greatly appreciated. Your responses will not be considered individually nor will you be identified in any way. Responses to the survey will be summarized by the UW Office of Educational Assessment.

1.	On average, how many hours per week have you spent on this course, including attending classes, reading, reviewing notes, completing activities, and any other course-related work?		Under 5	5-10	11-15	16-20	21 or More
2.	On average, how many **times per week** did you use the **Student Handbook** as a guide to learning EE 233 topics?	Never	Under 5	5-10	11-15	16-20	21 or More
3.	On average, how many **times per week** did you use the **class textbook** as a guide to learning EE 233 topics?	Never	Under 5	5-10	11-15	16-20	21 or More
4.	On average, how many times per week did you **contact the professor** for help outside of class?	Never	Under 5	5-10	11-15	16-20	21 or More

	Please rate the following aspects of the Student Handbook:	**Very Poor**	**Poor**	**Fair**	**Good**	**Very Good**
5.	The layout of the handbook was:	1	2	3	4	5
6.	The organization of material in the handbook was:	1	2	3	4	5
7.	The clarity of the narrative in the handbook was:	1	2	3	4	5
8.	The readability (ease of reading) of the handbook was:	1	2	3	4	5
9.	The helpfulness of the handbook in understanding course material was:	1	2	3	4	5
10.	The appropriateness of the examples in the handbook was:	1	2	3	4	5
11.	The thoroughness of coverage of the content for each topic was:	1	2	3	4	5
12.	The usefulness of the content in the handbook was:	1	2	3	4	5
13.	The real world examples and explanations were:	1	2	3	4	5
14.	The degree to which the handbook added to my understanding was:	1	2	3	4	5

15. What has been the most difficult aspect of learning the EE 233 material?

16. How did the Student Handbook contribute your learning?

17. What suggestions do you have to improve the Student Handbook?

PANDORA
EE215 Student Review

November 7, 2001

Things to Focus On

Does the site function correctly?
- ✓ animations
- ✓ links
- ✓ clear and consistent navigation

Is the content clear?
- ✓ writing style and clarity
- ✓ lesson length
- ✓ typos and mistakes
- ✓ animations

Is the content complete?
- ✓ Do you notice and important material missing that was included in your campus course?
- ✓ Are there other things you would like to see included?

Notes:

Pandora Project
Online Course Initial Interview

Student Name:_____ OEA Staff Name:_____

EE Class: _____ Date: _____

Phone: _____ Time begin: _____ Time end: _____

Best time to call: _____

Previous Distance Education Course Experience? ___yes ___no

This is _____ ; I am an outside evaluator for the EE 215 project and am calling to interview you about the course. Is this a good time to talk? The purpose of the interview is to gather information on class processes and progress. I would like to remind you that you have the right to abstain from answering any question and that your responses will be confidential. Information from all the interviews will be grouped into useful categories and given to the project manager for program improvement. Do you have any questions before we start?

1. Why did you choose to enroll in the EE online distance learning course? What are your learning goals?

2. So far, which aspects of the course are most helpful for understanding the material? What aspects of the course detract from your learning? What part of the curriculum seems to be most difficult to understand?

3. Do you feel your learning has been sufficiently supported throughout the course? Are you able to have your questions answered in a timely manner? What procedure or support would have been helpful?

4. How often and through what means have you been communicating with the instructor and other students throughout the course and how is it going? Do you feel comfortable contacting the instructor? Have you developed a student support network?

5. If you had the time and ability to enroll in this course on campus rather than via distance learning, would you do so? Why or why not? How many other online courses have you taken?

6. What changes would you suggest to improve the course?

Pandora Project
Online End-of-Course Interview

Student Name:_____ OEA Staff Name:_____

EE Class: _____ Date: _____

Phone: _____ Time begin: _____ Time end: _____

Best time to call: _____

Previous Distance Education Course Experience? ___yes ___no

This is _____ ; I am an outside evaluator for the EE 215 project and am calling to interview you about the course. Is this a good time to talk? The purpose of the interview is to gather information on class processes and progress. I would like to remind you that you have the right to abstain from answering any question and that your responses will be confidential. Information from all the interviews will be grouped into useful categories and given to the project manager for program improvement. Do you have any questions before we start?

7. Which aspects of the course were most helpful for understanding the material? What aspects of the course detracted from your learning? What part of the curriculum seemed to be most difficult to understand?

8. Do you feel your learning was sufficiently supported throughout the course? Were you able to have your questions answered in a timely manner? What procedure or support would have been helpful?

9. How often and through what means had you been communicating with the instructor and other students throughout the course? Did you feel comfortable contacting the instructor? Did you develop a student support network?

10. If you had the time and ability to enroll in this course on campus rather than via distance learning, would you do so? Why or why not?

11. What changes would you suggest to improve the course?

12. Knowing what you know now, would you have enrolled in EE215?

13. What advice would you give a student who is planning to enroll?