Robotics-Centered Curriculum (2007-2010)

Executive Summary Report

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SUBJECT: Executive Summary of Assessment of the "Living with the Lab" (LWTL) program

An overview of the assessment of the LWTL program is contained in this document. The assessment started in the spring of 2007. At this time, baseline data, from the old curriculum, was collected for ENGR 120, 121 and 122. In addition, data was collected for the new curriculum starting in the spring of 2007 and continuing through the 2008-09 academic year. Assessment data was collected in a variety of methods: course surveys, student focus groups, faculty and staff interviews, observation of the freshman expo, review of student work, and two on-site visits. Detailed analysis can be found in the final report. The purpose of this executive summary is to high light major findings.

MAJOR FINDINGS

1. The basic premise of LWTL is that students will have more "hands-on" participation if they own the hardware. If the average activities from all three courses (ENGR 120, 121, and 122) are tabulated, the total for the old curriculum is 43.9. The total for the new curriculum is 242.45. **This represents an increase of approximately 550%.** Faculty and student interviews, along with comments in student focus groups all support the survey data.
2. Another premise of LWTL is that "hands-on" participation will increase student confidence. ENGR 120, ENGR 121, and ENGR 122 surveys all show a statistically significant higher confidence in students' abilities to use the course hardware. Faculty and student interviews, along with comments in student focus groups support the survey data.
3. LWTL is completely institutionalized at Louisiana Tech: The LWTL sequence is required for all engineering majors. Faculty members from all programs participate in teaching in the sequence. Information about the program is used in recruiting students to Louisiana Tech. In addition, current students and alumni are excited about the program.
4. The program infrastructure is in place. There are lecture notes for faculty and students, detailed descriptions of materials required for various labs, dedicated workspace for the course, and a help desk for students. The requirements for course champions are clearly delineated.
5. There is a course champion who organizes the course materials including lecture notes, hardware, software, lab equipment, and the help desk. A course champion is needed to ensure the smooth running of LWTL. Currently there is one champion for ENGR 120, 121, and 122. There are additional champions for ENGR 220, 221, and 222.

6. The lecture notes, required hardware, consumable materials, required classroom space, requirements for the help desk have all been so well organized the overall LWTL can be easily described and disseminated to interested parties.
7. The program is structured in a modular format such that other institutions could adopt a single activity or multiple activities.
8. LWTL is sustainable. The costs of administering the program are paid for by charging the students for hardware and software. The costs to the students are reasonable. The costs are comparable to the cost of a textbook for three quarters and are only slightly higher than the cost in the old curriculum.
9. LWTL gives students a better introduction to engineering than the old curriculum provided. Students can make a more informed decision about whether or not engineering is what they want to do.
10. LWTL is a powerful recruiting tool. Potential students like the idea of doing engineering immediately with real components.
11. Several faculty members feel that teaching LWTL is more difficult than a traditional course the first time that they teach it. After the first time, teaching LWTL is comparable to a traditional course. Even with the additional overhead the first time teaching the course, all faculty members felt the benefits to the students made up for the additional work.
12. The faculty members teaching LWTL are enthusiastic, motivated, and have a passion for the curriculum. They believe that the hands-on activities are vital to preparing students for an engineering career. The LWTL faculty members are dedicated to providing their students with a quality education.
13. The effect of enthusiastic, dedicated and excellent faculty cannot be underestimated. The LWTL faculty members remain dedicated to preparing their students to be successful. In addition, the engineering administration supports the LWTL effort completely. In fact, the engineering administration would like to encourage the use of a technology platform to implement concepts in the upper division courses.
14. Presentations on LWTL have been recognized at the ASEE National Conference in two out of the last three years.
15. Faculty members report that LWTL gives students better preparation for the sophomore year in 2 out of the 3 courses. (ENGR 220, 221, 222)
16. The LWTL curriculum is appropriate for both honors students and students in a traditional curriculum. Traditional students participate in the "hands-on" activities and develop confidence in a manner similar to the honors students.
17. Students are able to conceive, construct, and demonstrate creative projects for the Freshmen Design Expo.

SUGGESTIONS

1. The surveys should be continued, but they should be reduced in length. Consider including only the 17 common item comparisons and the "hands-on" activities table. This information can be examined to determine if there is any change in perception of the students over time.
2. The Design Expo contains a wealth of information about student abilities. The list of all completed student projects demonstrates the breadth of student projects. The invitation of outside evaluators to review the projects is an excellent resource that can be further utilized. For example, the evaluators see what the students are able to do. A rubric for the design projects should be developed that addresses the curriculum goals so that outside evaluators can comment on the effectiveness of the curriculum. This could be used as a direct measure for accreditation

purposes, if desired. As the YouTube videos are developed, these videos could be viewed by external evaluators and rated based on a rubric. The student accomplishments are amazing and capturing these accomplishments can be beneficial for recruiting and accreditation purposes.

3. Consider surveying employers of students for internships and/or co-ops to determine if they detected any difference in the students that have taken the LWTL curriculum.

4. Questioning faculty members who teach sophomore courses revealed a net positive effect of the LWTL curriculum. It would be interesting to conduct interviews with faculty members who teach juniors and seniors to see if they detect any difference in the students who have been in the LWTL curriculum.

5. The relationship between confidence and frequency of performance is not clear. There is definitely a link, but it is possible to perform an activity frequently and still not feel confident and it is also possible to feel confident without having to perform an activity extensively. Methods for exploring this relationship could be explored in later research.

6. Consider following the performance of the LWTL students after graduation as those students graduate.

7. The LWTL curriculum has demonstrated the ability to increase student confidence and frequency of performance in several key items. Sharing the expertise that has been developed at Louisiana Tech should be investigated. There are several options that could be explored: developing a book or workshops, seeking partner schools for implementation, and/or seeking additional grant funding to increase implementation such as a CCLI Phase 3 grant.