AC 2008-1238: DOES THE INDEX OF LEARNING STYLES PREDICT LABORATORY PARTNER SUCCESS IN ELECTRONICS COURSES?

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Introduction

This paper presents the results of a study into the success of various combinations of learning styles for laboratory partners in electronic courses. Specifically we are using the Introduction to Communications (electronics) course/lab in the Department of Electrical and Computer Engineering Technology. The lab consists of ten different exercises and culminates in a final project in which the students build and test a superheterodyne receiver. At this time, students are allowed to choose their partners, generally considered to be based on friendship and past experience. The goal of this project is to understand if the learning styles combination of lab partners can predict the success of the partnership. Each student was asked to complete the Index of Learning Styles (ILS) questionnaire developed by Felder and Soloman[1]. The partners ILS reports were than paired and reviewed for commonalities and differences. The success of the lab partners were based on the overall lab scores and functionality of the receiver project. Factors such as habitual absenteeism and tardiness as well as overall course grade were also considered. The results of this study may suggest faculty to consider developing alternative strategies for lab partnership.

Course of Interest

The study described is being testing in a junior level electronic communications course. The course introduces the systems level theory and techniques of sending information. This includes signal analysis, various modulation techniques, transmitters, receivers, impedance matching techniques and filters. This is a four credit course including three fifty minute lectures and a two hour lab each week with nominally 40-50 students per semester. The laboratory component of this course is extensive to assist the students in applying the theory gained during lecture.

The labs consist of ten lab exercises, a few labs run multiple weeks. Five of the labs involve building various parts of a superheterodyne receiver (shown in figure 1.) Many of these components are built on printed circuit boards using surface mount technology. The 2nd lab consists of building the bandpass filter to operate at the Frequency Modulation (FM) range of 88-108 KHz. The 4th lab involves building the local oscillator required for mixing operations. The mixer is built in lab #8 along with the FM demodulator. The 9th lab requires building the FM amplifier on the same board as the bandpass filter. By the 10th lab these components are strung together to make an operational system.

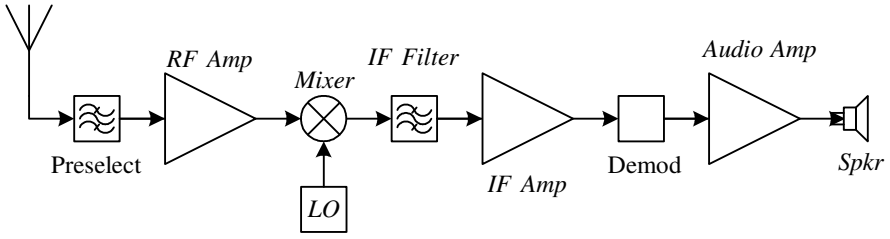

Figure 1 Superheterodyne Receiver

The students currently work with self-chosen partners which are assumed to be based on friendship and past experiences. In the last three semesters an average of 90% of the final projects have been completed successfully along with additional components for extra credit. This study looks into the success of partnerships and how this may correlated to the various learning styles of the partners.

Study Design

The goal of this project is to understand if the learning styles combination of lab partners can predict the success of the partnership. The study looks at the success of lab partners in terms of the overall lab scores and the functionality of the receiver project. In the beginning of the course a required homework is assigned where the students are requested to review Professor Richard Felder's webpage[1] and complete the Index of Learning styles survey[2]. In addition, the students are asked to identify one learning style, describe it and provide techniques which they may use to improve upon this learning style. The students are instructed that the results of the learning styles questionnaire do not account for the grade assigned to the homework, but rather their approach to the learning style they chose to describe and improve through various techniques. The questionnaires are collected and sorted into learning style groups. This is done to have a first understanding of the learning styles present in the course to assist the instructor in achieving classroom presentations which are appropriate for the students involved. There is no further activity done with these questionnaires until the course has been completed and the results of the lab and projects are assigned.

Following completion of the lab projects, the correlation between lab partner success rates and learning styles began. The partnerships were organized from highest to lowest based on the overall lab scores and the functionality of the receiver. Factors such as habitual absenteeism, tardiness or events such as problems between partners were identified and those pairs were eliminated from the study. The questionnaires were then rearranged by lab partners. Commonalities and differences between partners were first identified. In particular, the degrees of active vs. reflective, sensing vs. intuitive, visual vs. verbal and sequential vs. global learning had to be reviewed. Each partnership was then described based on the learning styles present and the degree to which these learning styles were found.

Results

This study is in it's infancy with follow on studies planned to increase the number of participants. The results of the initial look into the type of learning styles was interesting in that all but one in a class of thirty-eight students were visual learners. This may be due to the nature of the ECET major which may appeal to visual learners. The one verbal learner was a nontraditional student in his late twenties. He was attending school and working full time. Due to his non traditional status and problems with his partnership, this student was excluded from the study. Thus all students in the partners were visual learners. This required a more detailed look into the degree of visual learners to assess any differences in this style. The style of active versus reflective learning revealed approximately half of the class to be active and the other half reflective. This was similar with the learning styles of sequential versus global learning although

not due to the same students. In general, most of the students were identified to be sensing rather than intuitive learners.

Of the nineteen possible partners, fifteen were deemed suitable for the study. To date there is not a significant difference between any of the learning style pairs which showed success. Extremely successful partnerships were a result of one student being and active learner while the other was a reflective learner. On the other hand, with both partners being active learners, success was also shown. One interesting result showed that success was more common for partners who showed a high degree of active or reflective learning rather than the mid range of these extremes. In terms of the sensing, most of the students showed a dominant style of sensing rather than intuitive learning. Where intuitive learners were involve in the partnership, highly successful teams and not so successful teams were the result. This parameter does not seem to predict partnership success. Sequential and global learning also did not seem to predict the quality of the partnership. The number of participants will continue to increase as this study is scheduled to continue through the spring 2009 semester. It is anticipated as the numbers increase a significant difference will emerge. As well, an alternative method of assessment may be appropriate. As the study continues, a more detailed instrument fo raccessing the students learning style will be sought in addition to providing more specific evaluation of student success. Instead of using the overall laboratory grade and system functionality, individual components of the laboratory exercises which demonstrate students learning styles[3] can be evaluated and used to correlate learning styles with laboratory success.

Summary

The results of the current study do not present a clear prediction of electronic course laboratory partnerships based on learning styles. This may be due to the small number of participants thus far and will be improved upon as the study continues. This may also be due to the instrument used to assess learning styles and the high level of accessing student success. It is clear from the current results that most electronic students can be classified as visual learners rather than verbal learners. This may be an intrinsic fact of electronic students as opposed to history students. Perhaps the challenge is to develop a better instrument to more clearly identify differences in students who choose electronics as their majors. Overall, this is an important study to be performed. As the world moves toward teamwork and collaboration, particularly between disciplines and cultures, it is extremely important to understand which teams work best together and why.

Bibliography

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