Cooperative learning is shown to increase students' success in a digital signal processing class.

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ABSTRACT

At Universitas Andalas, students majoring in Electrical Engineering are required to complete a DSP course. This course is designed to teach students the principles of digital signal processing and how it may be used in the real world. Since a teacher-centered method was used to deliver the course material, the CLO was not properly addressed. The purpose of this article is to provide guidance on how to implement collaborative learning strategies in digital signal processing (DSP) classes. The purpose of this research is to determine whether this method is helpful in learning DSP. The study is being conducted in the Digital Signal Processing (DSP) course offered by the Electrical Engineering Department at Mandalas University. We gather this data via a variety of approaches, such as introspection, assigned reading, a final project, and formal assessment. The proposed idea is evaluated in light of the target stated in the semester learning plan. Descriptive results are presented for this investigation..

Keywords:

Collective teaching, Success indicators, Non-hierarchical classroom layouts, and Putting Students First.

INTRODUCTION

In order to graduate from the Electrical Engineering program at Universitas Mandalas, students must complete a course in digital signal processing (DSP) (Unhand). The last semester of the school year is reserved for this course. All Signal and System [1] students in the department must take the course before starting the DSP programme. Learning goals have guided the high school (K-PT) curriculum for Electrical Engineering at Unhand since 2016. IABEE learning outcomes were developed with reference to the SNPT (Indonesian National Higher Education Standards) and the KKNI (Indonesian National Qualification Framework). Several student learning outcomes (SLO) are used to guide and evaluate instruction and assessment in the Department of Electrical Engineering. These SLOs include, but are not limited to, the following: (1) a solid understanding of the engineering sciences, engineering principles, and engineering design necessary for the analysis and design of electrical power systems, communications systems, and control systems. (2) Confident in applying the findings of information and data analyses to problem-solving in the field of specialization. Finally, they are skilled in applying mathematical, scientific, and technological approaches to complex problems in electrical power, communications, and control systems [1-2].

The course learning outcomes for digital signal processing were based on these SLOs. The ability to convert between analog and digital formats is a critical learning outcome for the DSP. Student (2) is an expert in analyzing digital systems in the z-domain. Thirdly, the student must demonstrate proficiency in the use of discrete-systems mathematics. (4) A student may successfully implement a filter in the frequency domain. Since DSP is a mandatory course, it typically draws about 130 students each semester. Learning the CLO was challenging since the course followed a more traditional model of instruction. So-called "teacher-centred" learning (TCL) places the instructor front and center in the classroom. The strategy has certain drawbacks, one of which is that it promotes students' passivity in class, which in turn increases the number of students who do poorly academically. The CLOs are underperforming the market. This is supported by a look at the grades students have earned in DSP during the last two years.

The academic outcomes of pupils have been shown to improve when they study in groups. Working in groups has been shown to assist students academically [3, 4] and to facilitate greater information transfer [5, 6]. Group work is an excellent way to enhance interpersonal abilities including public speaking, information presentation, problem solving, leadership, delegation, and information organization [6]. In light of this study, for the next

academic year (AY 2020/21) we propose implementing a cooperative learning strategy into the DSP course with the intention of improving the quality of students' predetermined CLOs. As a result, students' average performance in the class increased.

METHODS

The Mandalas University Electrical Engineering Department's DSP Classes (A, B, and C) are all participating in the study.

A total of around 133 individuals are enrolled in this class. Groups of these pupils have been formed. The group's make-up, including the mix and variety of its individuals, is decided by using the student list provided from the learning management system. To prevent cliques from forming among students, instructors always randomly assign them to groups rather than letting them choose their own. Given the underrepresentation of females in the class, (b) at least one female student is included in each group. c) Each class group consists of an equal number of students from the same cohort. It follows that there are somewhere from 9 to 10 groups, each consisting of anywhere from four to five pupils. In order to collect this information, we use several forms of assessment, including homework, assignments, midterms, and final exams, to measure how well our students have grasped the material presented in class. To further improve the information, self-evaluation is also implemented. The analysis is performed by determining what proportion of pupils get a score higher than the goal. We want all of our students to get at least a 55 on each CLO. 55 is the equivalent value of a "C" according to Andalas University's Academic Regulation. There should be at least 55% of students who are successful in each CLO. The indicator is updated with the results of summative evaluation. The analytical result is then described in detail.

WHAT WE FOUND AND HOW WE TALK ABOUT IT

Students' personal responsibility, collaboration, and communication abilities, among other "soft skills," may be described via data collected through self-assessment, homework, and assignments. You may see examples of these three softer abilities in figures 1, 2, and 3

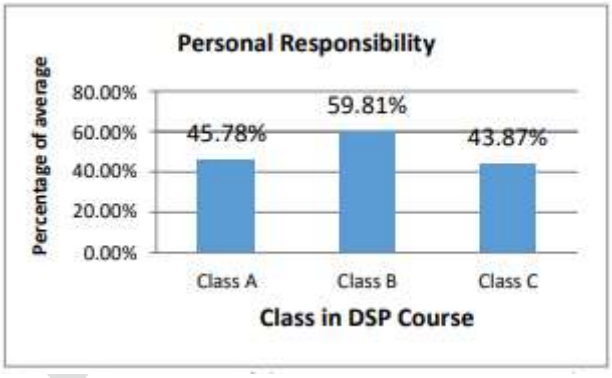

Figure 1 Percentage of the average score on personal responsibility in a group.

Figure 1 shows that students in class C have the lowest average score, which is 43.87% on personal responsibility in the group. Class B is the top scorer and the second by Class A with the average score of 59.81% and 45.78% respectively.

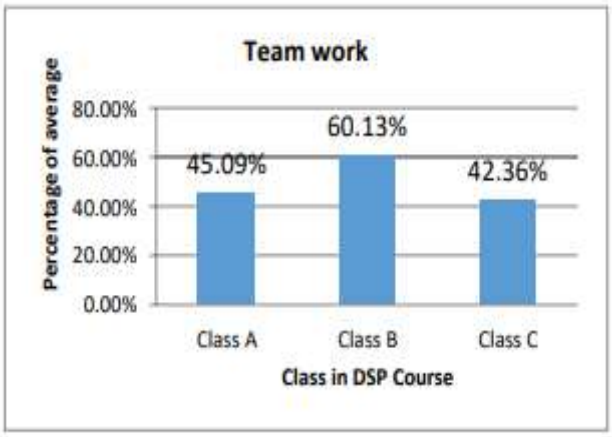

Figure 2 Percentage of the average score on teamwork in a group.

Students in Class B have the highest average score which is 60.13% on teamwork. At the same time, Class A and Class C are the second and the last with the average score of 45.09% and 42.36% respectively.

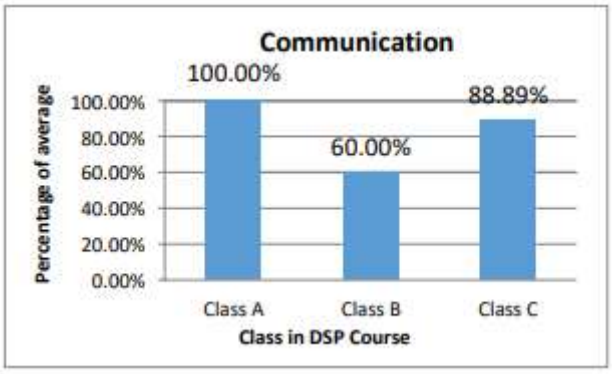

Figure 3 Percentage of the average score on communication in a group.

The pupils in Class B had the lowest average score on communication abilities (figure 3). Class A students have the greatest average score, at 100%, while Class C students have the lowest, at 88.89%. The Assignment, Final Project, Midterm, and Final Exam all measure and evaluate students' progress towards CLOs. The student's performance in CLO 1 was evaluated through the Assignment, and CLO 2 was evaluated via the Final Project. Students' progress towards CLO 3 and CLO 4 is measured by the Midterm and Final examinations. Figure 4 provides a concise overview of the CLO evaluation outcomes. The results are reported as a percentage in accordance with the DSP course's semester-long learning plan.

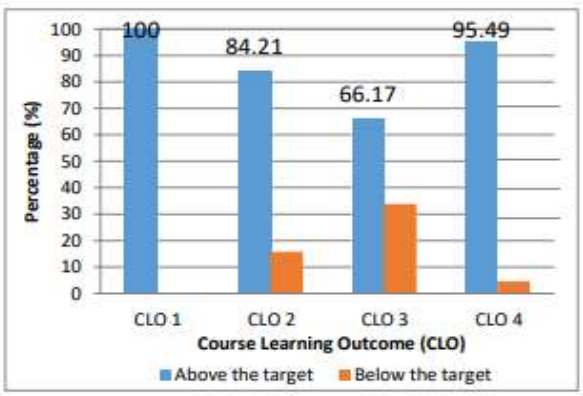

Figure 4 Percentage of achievement on different CLOs.

When compared to other examinations, the percentage for CLO 1's evaluation is the highest at 100%. A student's ability to create a filter that satisfies frequency-domain parameters is shown in CLO 4, which follows this CLO 1. CLO 2 represents 95.49 percent of the total debt. Fourth and fifth place are held by CLO 2 (84.21%) and CLO 3 (66.17%). In general, each CLO % is higher than the goal. Each CLO's goal is 55%. Equally important, the bare minimum is a 66.17% mark. In order to determine a student's final grade for the 2019-2020 school year, all of their assessment scores will be added together. Figure 5 depicts the Alphabet conversion from score to letter grade.

In this next school year (2019-2020), students will get a grade that reflects the enhanced success they've had in the course so far. Each CLO exceeds its quota by at least 66.17 percent. The fact that more students were successful in completing the course this year lends credence to this observation.

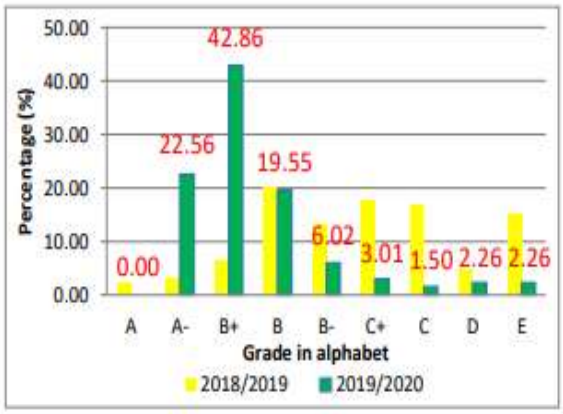

Figure 5 The comparison of the grade distribution between two academic years in the DSP course

Similarly, the number of students who earned an A- or B+ during the 2019-2020 school year has grown. There was a total increase of 55.74 percent compared to the previous year. The same rule of thumb is used for the A- grade.

CONCLUSION

Based on the results of this research, it can be said that the use of cooperative learning techniques in a digital signal processing course significantly enhances the educational value of the experience. Each CLO exceeds its quota by at least 66.17 percent. The fact that more students were successful in completing the course this year lends credence to this observation.

REFERENCES

[1] Kurikulum Program Studi Sarjana Teknik Elektro Tahun 2016.

[2] Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia No 73 Tahun 2013 tentang Penerapan Kerangka Kualifikasi Nasional Indonesia bidang Pendidikan Tinggi, 2013.

[3] Cockrell, K.S., Hughes - Caplow, J.A. and Donaldson, J.F. A context for learning: collaborative groups in problem-based learning environment, Review of Higher Education, 2000.

[4] Johnson, D.W., Johnson, R. and Stanne, M. Cooperative Learning Methods: A Meta-analysis. compared with the academic year (2018/2019).

[5] Brandon, D.P. and Hollingshead, A.B. Collaborative learning and computer-supported groups, Communications Education, 1999.

[6] Cheng, W. and Warren, M. Making a difference: using peers to assess individual students' contributions to a group project, Teaching in Higher Education, 2000

[7]A. W. Bates, "Technology: Open Learning and Distance Edu-cation," UK: Routledge, London, 1995.

[8] L. Harasim, S. R. Hiltz, L. Teles, and M. Turoff, "LearningNetworks: A field Guide to Teaching and Learning Online,"MA: MIT Academic Press, Cambridge, 1995.

[9] B. J. Millis and P. J. Cottell, "Cooperative Learning for HigherEducation Faculty," AZ: Oryx, Phoenix, 1998.

[10] R. M. Diamond, "Designing and Assessing Courses and Cur-ricula," SF: Jossey-Bass, 2nd ed., 1998.

[11] A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, "Signalsand Systems," NJ: Prentice Hall Publishers, 2nd ed., 1983.