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Progress Analysis of Peer Teaching Assistant System

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Abstract:
How would an English teacher confronts the situation when students, particularly those whose majors are not necessarily English literature, claim being having difficult time in learning the contents in the English language classrooms during the semester? The possible feedbacks are often being "uninterested in the materials", "clueless about the lectures", and "totally or partially unprepared for the course." This study proposed the Peer Teaching Assistant (PTA) System to confront the situation in the nowadays classrooms. The collected data was explored by the techniques of linear and quadratic regressions. Not only the PTA system motivated students in the classroom, but also it harmonized the gaps among students. The PTA system lowered down the cost for instruction with classroom management skills.

Keywords: *English teaching, peer teaching assistant*

1. Introduction

In view of the influence of Chinese culture, the teacher-student relationship between teachers and students is not as natural and barrier-free as that in the western cultures. The chasm seems to sacrifice the efficiencies in the process of learning and imparting knowledge.

"Freshman English" is a core course for all the freshmen in all the majors. This course requires advanced capacity in vocabularies and grammars in order to meet the expectations flawlessly. However, students in average do not come with the capacity and inevitably they get frustrated when taking the course. Before long, the negative feedback of frustration will lead the study of the students into despair. The students gradually become self-degrading and backward since. The failures burst out at the end of the semester. Holistically speaking, this cannot be a win-win situation for both the teacher and students. The aim of this study is to provide a prompt, efficient and real-time feedback mechanism for the instructor so that he or she can monitor the dynamics of the studying for the class and act accordingly with a much shorter turnaround time [1].

In a typical undergraduate classroom, it is the responsibility of the teacher to look after the multitude of the students in the class, not a few outstanding elites. In addition to trying to improve the knowledge level of the whole class, teachers should also pay attention to whether the majority of the students in the same class are evenly keeping up with each other and no one is significantly left behind without receiving any attention [2].A teacher should constantly ask "What does the distribution of studying achievements for all the students look like - a bell shape curve or an M shape curve?"This study will suggest the "Peer Teaching Assistant System "to tackle the aforementioned concerns. Linear and quadratic regression techniques are applied to investigate the collected grades of quizzes. The conclusions are drawn with rational analysis of the variances based on the grades.

2. The Peer Teaching Assistant System

2.1. Data Acquisition

The involved samples are the students in the class of "Freshman English" of the civil engineering department of Yishou University in the fall semester of 2018. There were 26 students registered in the class. There were three students failed to attend the final exam. Therefore, the effective number of samples is 23. The twenty-three students are denoted as $S_i, i \in \{1,2,...,23\}$. Three in-class quizzes were given in the semester. Each quiz took up 30 minutes. Each quiz was announced to the student one week prior to the quiz date. The fourth quiz is the final examination which lasted for two hours. The final examination covered all the materials taught in the semester. The four tests are denoted as T_j, $j \in \{1,2,3,4\}$. The grade of test T_j for a particular student S_i, is denoted as $x_{i,j}$.

2.2. The Mechanism of Peer Teaching Assistant System

"An excellent scholar makes an adept teacher." This is the principal philosophy of the mechanism of how the PTA System works but it is still incomplete. "Empathy" is actually the key to the success of the system.

2.2.1. About "An Excellent Scholar Makes an Adept Teacher"

After finishing grading the first test, i.e.T_1, the instructor picked the top five students and the bottom five students according to the grades. Then one-on-one buddy system is set up. The top five students were set to aid the bottom five in reviewing the solution of T_1. The top five will also work with the bottom five on their next homework. The same actions are taken repetitively to T_2 and T_3. Please note that there were only 23 effective samples yet there were already ten students, which is almost half of the samples, remained involved in this PTA system project.

2.2.2. About "Empathy"

Most students grown up under the traditional Chinese or Asian cultures are prone to fear teachers without rational reasons. However, this mentality does not exist among peer students. Peer teaches peer is a new teaching approach which subverts the traditional ways of in-class instructions. Due to the existence of up-building frustration in the classes, the bottom five students would feel much at ease if assisted by his or her classmates instead of the superior professors. Any teacher or professor's energy is limited. The existence of PTA System remedies the gap of this shortfall.

The mastery of the knowledge makes a teacher professional. However, the teacher might have long forgotten the obstacles and hinderances in the steep learning curves when he was a student years ago. For this reason, the teacher often got puzzled about why students could not understand his teaching. He also failed to foresee where the stumbling blocks were which deterred students from efficient learning. On the contrary, the peer student teachers had just gone through the learning and remembered all the stumbling blocks along the knowledge tree in this course. The top five students could navigate the bottom five students through the labyrinth with proper pace and same wavelength of talking.

3. Data Analysis

The grades of the four tests of each sample are organized into an array of column plot as shown in Figure 1.

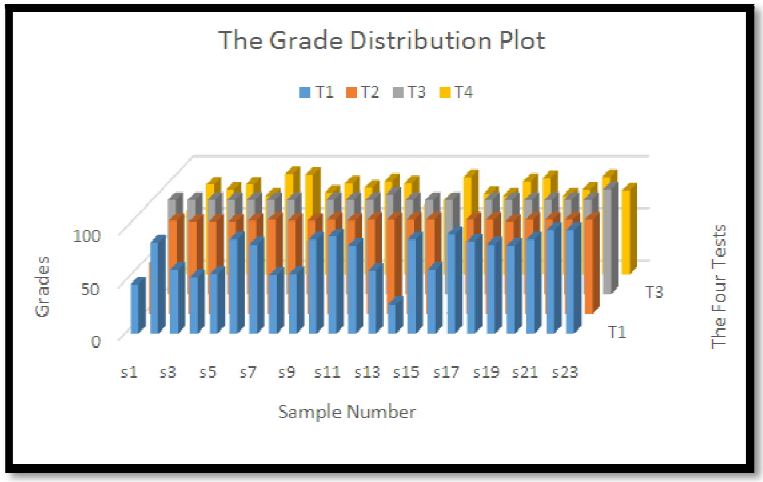

Figure 1: The Grades for the Four Tests of Each Sample

3.1. Data Processing

The curve fitting functions in MATLAB are applied in order to extract the information about how well the students performed in each test.

Step 1: After the completions of Tests 1, 2 and 3, i.e. T_1, T_2 and T_3, the three grades of each sample were linearly regressed into a straight line. We obtained the slope of the straight line, i.e. v_i. In the meantime, we regressed the three grades with a quadratic polynomial and we obtained the acceleration made of the three grades, i.e. a_i. Note that the acceleration stands for the potential of the student about how well he might do in tests of the near future. Repeat the above calculations for all the 23 samples and then we obtain 23 sets of (v_i, a_i) [3][4].

Step 2: After the completions of Tests 2, 3 and 4, by following the same procedure shown in Step 1, we obtained another 23 sets of (v_i', a_i').

Step 3:Taking the 23 sets of (v_i, a_i), we constructed an x-y scattered plot to visualize the distribution of the location of the 23 sets of (v_i, a_i). Next, we linearly regressed the 23 sets of (v_i, a_i) and drew it with dashed line as shown in Figure 2. The x axis is the slope v_i and the y axis is the acceleration a_i. The mean square error (MSE) is 16.16.

Step 4:

Follow Step 3 and do the same to Tests 2, 3 and 4. The plot of (v_i', a_i') is shown in Figure 3. Note that the RMS of the linear regression is smaller, i.e. 11.17.

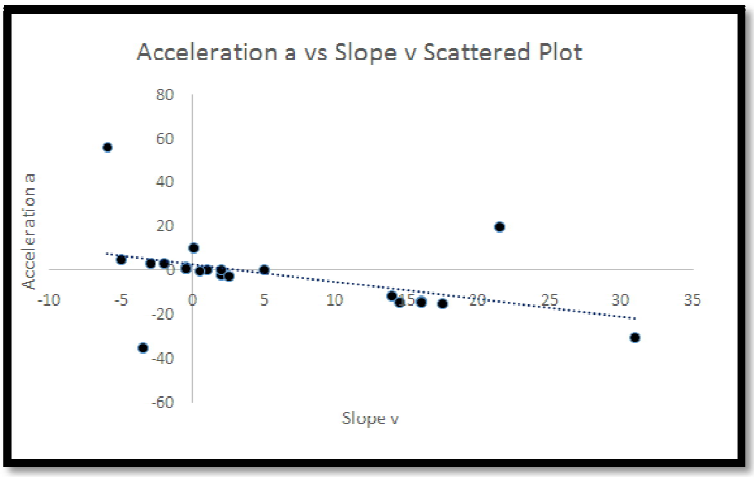

Figure 2: The Scattered Plot of Acceleration Vs Slope Distribution of T_1, T_2 and $T_3$for the 23 Samples

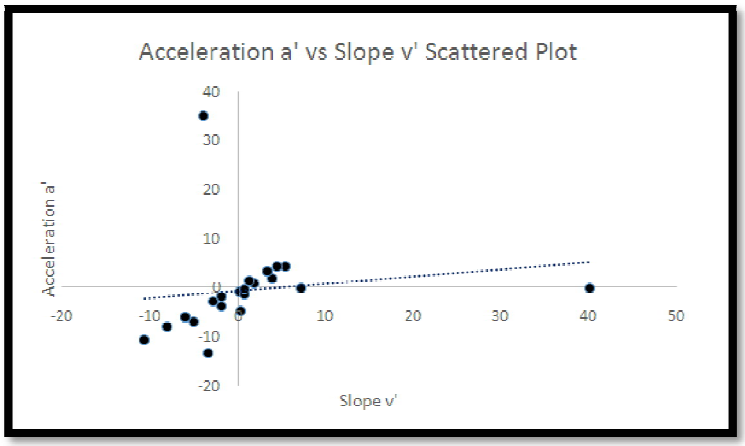

Figure 3: The Scattered Plot of Acceleration Vs Slope Distribution of T_2, T_3 and T_4 for the 23 Samples

3.2. Data Interpretation

- In Figure 2, the horizontal axis stands for the value of the slope v_i of each one of the 23 samples. The larger the v_i is, the more it indicates that the student S_i is making progress along withthe tests T_1, T_2 and T_3. We call these students "ascending samples."
- The vertical axis stands for the value of the acceleration a_i of each one of the 23 samples. The more positive and larger the a_i is, the more it indicates that the very student has a great potential to alternate and improve his current test situation a long withT_1, T_2 and T_3 despite of his current descending grades, if any. We call these students "potential samples." If a student has positive a_i no matter his or her v_i is positive or negative, we may allege the very student is likely to make some progress in the next test, T_4.
- Figure 3 depicts the same things as Figure 2 does except that Figure 3 focuses on T_2, T_3 and T_4.

Peer Teaching Assistant System is a mechanism which tries to build up a buddy system between academically successful students and those who seemingly cannot catch up with the in-class teaching [5][6]. The buddy-teaming began right after $T_1$was graded and was carried out through T_2 and T_3. The slopes and accelerations obtained from regressing the grades were quantized and viewed as the performance index of each student. In the meantime, by observing the distributions of the slopes and accelerations shown in Figure 2 and Figure 3, we can evaluate if the PTA system does take effect or the system is simply a wishful imagination. By observing Figures 2 and 3, three phenomena are detected.

- The number of sample in quadrant I is increased in Figure 3.By cross-checking Figures 2 and 3, one can tell the number of sample in quadrant I is increased in Figure 3 [7].
- The sample distribution clusters more compactly in Figure 3. By looking at Figure 3 and Figure 2, it is obvious that the points look more compact in Figure 3 than in Figure 2.
- The number of sample in quadrant III is increased in Figure 3.In Figure 3, the samples began to emerge in quadrant III by compared with Figure 2. The possible reason is due to the final examination which was adjunctly given by two other instructors. The tempo and color hue of T_1, T_2 and T_3 are definitely different from the ones of T_4. Due to the variation in the tempo and color hue, a gap appears in students' performance in T_4. This event of variation seems to overpower the mechanism of the Peer Teaching Assistant System.

4. Conclusions

It was observed that the students in the class generally showed positive attitude toward their learning after the implementation of the Peer Teaching Assistant System. There seemed to be a natural and cheerful alternative to the learning which has been ignored by both teachers and students. The Peer Teaching Assistant System unlocked the humane alternatives and hence improved the overall efficiencies in both learning for students and instruction for teachers.

What has the system implemented and achieved? According to Part A in Section 3.2, the system clearly brought up more role model students, who have positive slope and positive acceleration, once the system was implemented. Positive slope indicates the grades of the student are improving in three consecutive tests. Positive acceleration further guarantees the momentum of improvement in grades of tests. Also, the author would like to point out that the mechanism of this system is not meant for high and fancy grades of students' tests. The high-and-lows of the grade depend on the difficulty of the test questions which acts as an independent factor from the system. The Peer Teaching Assistant System was designed to help the students who have poor learning skills to improve their learning skills. Also, the system coached a few teaching assistants for the entire class.

According to Part B in Section 3.2, the sample distribution in Figure 3 is more clustered than the one in Figure 2.It indicated that the learning gaps among the classmates are closing up under the benign interactions facilitated by the system. The root-mean-square error is lowered from 16.16 in Figure 2 to 11.17 in Figure 3. Evidence reveals the learning gaps are narrowing down among students.

The Peer Teaching Assistant System cannot guarantee the high profile of student grades nor it is meant for this purpose. Part C in Section 3.2 explained why so. The system did not follow up each individual and their progresses. The mechanism functioned anonymously and could not fine-tune any particular student with his learning. The system looked in to the progressive variations and took timely actions in assisting students in their studies.

The project lasted for six months in the fall semester of 2018 and the outcomes matched the expectations. It is an indication that the Peer Teaching Assistant System is an effective design in enhancing students with their studying. However, the number of sample is small which makes the results less convincing. In the future work, the author would like to increase the pool of samples and try to track down each individual about their progresses.

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